Refrigeration & Air Conditioning

1. (1.5.1.1-1) Traditionally, which of the listed refrigerants has been more suitable than the others for use in a centrifugal refrigeration compressor?

- (a) R-11
- (b) Carbon dioxide
- (c) Ammonia
- (d) R-12

If choice a is selected set score to 1.

2. (1.5.1.1-2) Which of the fluids listed is suitable for use as a secondary refrigerant?

- (a) Carbon dioxide
- (b) Cuprous chloride
- (c) Methyl alcohol
- (d) Brine

If choice d is selected set score to 1.

3. (1.5.1.1-4) Which of the following substances is normally classified as a low pressure refrigerant?

- (a) R-22
- (b) R-123
- (c) R-134A
- (d) R-12

If choice b is selected set score to 1.

4. (1.5.1.1-3) R-134a is often the replacement for which older type of refrigerant?

- (a) R-12
- (b) R-123
- (c) R-11
- (d) R-22

If choice a is selected set score to 1.

5. (1.5.1.1-5) Which of the following refrigerants is chlorine free and safe regarding atmospheric ozone depletion?

- (a) R-11
- (b) R-134a
- (c) R-12
- (d) R-22

If choice b is selected set score to 1.

6. (1.5.1.2-9) What is the color coding for a storage container of R-134a refrigerant?

- ○ (a) green
- ○ (b) grey
- • (c) light blue
- ○ (d) purple

If choice c is selected set score to 1.

7. (1.5.1.2-1) What is the most important consideration in selecting a lubricating oil for use in a refrigeration compressor?

- • (a) have a low pour point
- ○ (b) have a high wax content
- ○ (c) have a high freezing point
- ○ (d) have a low viscosity index

If choice a is selected set score to 1.

8. (1.5.1.2-8) If you mistakenly change from a lower pour point lubricant to a higher pour point lubricant in a refrigeration system, what will be the result?

- ○ (a) compressor lubrication will be improved
- • (b) oil may congeal in the evaporator
- ○ (c) compressor valves will be damaged
- ○ (d) oil will not leave the crankcase

If choice b is selected set score to 1.

9. (1.5.1.2-2) Properties of a good refrigeration compressor lubricating oil include which of the following?

- • (a) low wax content
- ○ (b) high pour point
- ○ (c) high viscosity
- ○ (d) all of the above

If choice a is selected set score to 1.

10. (1.5.1.2-3) The lubrication oil in the crankcase of a refrigeration compressor that is shut down is heated. For what purpose is this done?

- • (a) reduce absorption of refrigerant by the oil
- ○ (b) prevent refrigerant vaporization
- ○ (c) remove wax and gum
- ○ (d) remove entrained water

If choice a is selected set score to 1.

11. (1.5.2.1-3) The "tare weight" of a refrigerant storage cylinder refers to what weight?

- ○ (a) the total weight of a fully charged cylinder
- • (b) the weight of an empty cylinder
- ○ (c) the weight of a cylinder AND its current contents
- ○ (d) the maximum weight of the refrigerant allowed

If choice b is selected set score to 1.

12. (1.5.2.1-2) The gas that exists in the stratosphere forming a protective shield that helps to protect the environment from the harmful effects ultraviolet radiation is called what?

- ○ (a) nitrogen
- ○ (b) oxygen
- ○ (c) radon
- • (d) ozone

If choice d is selected set score to 1.

13. (1.5.2.1-1) The term 'oil foaming' in refrigeration practice, is used to describe what event?

- ○ (a) release of dissolved lubricant from the refrigerant in the crankcase
- ○ (b) sudden evaporation of entrapped moisture from the crankcase lubricant
- ○ (c) sudden evaporation of entrapped air from the refrigerant liquid
- • (d) release of miscible refrigerant from the lubricant in the crankcase

If choice d is selected set score to 1.

14. (1.5.2.2-2) Regarding heat transfer principles, which of the following is true?

- ○ (a) Heat transfer always flows from cold regions to hot regions.
- ○ (b) A gas can transfer heat more efficiently than a liquid.
- ○ (c) Steel pipe can transfer heat more efficiently than copper pipe.
- • (d) Heat transfer always flows from hot regions to cold regions.

If choice d is selected set score to 1.

15. (1.5.2.2-4) What is the physical state and pressure condition of refrigerant as it enters the condenser of a typical refrigeration system.

- ○ (a) low pressure vapor
- ○ (b) low pressure liquid
- • (c) high pressure vapor
- ○ (d) high pressure liquid

If choice c is selected set score to 1.

16. (1.5.2.2-1) At ambient temperature and atmospheric pressure, what is the status of R-134a?

- (a) sub cooled gas
- (b) odorless gas
- (c) corrosive liquid
- (d) superheated liquid

If choice b is selected set score to 1.

17. (1.5.2.2-6) What is the pressure and condition of the refrigerant entering the receiver of a refrigeration system?

- (a) superheated low pressure vapor
- (b) sub cooled low pressure liquid
- (c) superheated high pressure vapor
- (d) sub cooled high pressure liquid

If choice d is selected set score to 1.

18. (1.5.2.2-5) What is the physical state and pressure condition of refrigerant as it leaves a receiver in a typical refrigeration system?

- (a) low pressure vapor
- (b) high pressure vapor
- (c) low pressure liquid
- (d) high pressure liquid

If choice d is selected set score to 1.

19. (1.5.2.2-3) Refrigerant entering the compressor of a refrigeration system should be in which of the following conditions?

- (a) Low pressure vapor
- (b) High pressure liquid
- (c) High pressure vapor
- (d) Low pressure liquid

If choice a is selected set score to 1.

20. (1.5.3.1-1) When repairing a refrigeration system, a swaging tool set would be used to carry out which of the following operations?

- (a) Swaging tools are no longer used with repairing refrigeration systems due to progressive changes in the tool industry.
- (b) Swaging tools are used to remove any sweated edges formed on the tubing while soldering.
- (c) Swaging tools can be used to expand an end of one tube to fit onto a tube of the same original outside diameter.
- (d) Swaging tools are used during the breaking-in of refrigeration compressors and drive motors.

If choice c is selected set score to 1.

21. (1.5.3.2-7) Which of the following statements is true concerning the illustrated gauge manifold set? Illustration GS-RA-01

- (a) Closing the valve labeled "G" isolates the hose labeled "H" from the gauge labeled "A".
- (b) The valves labeled "G" and "C" must both be open to read system pressures on the respective gages labeled "A" and "B".
- (c) Closing the valve labeled "G" isolates the hose labeled "H" from the hose labeled "J".
- (d) Opening fully and back seating the valve labeled "G" isolates the gauge labeled "A" from the hose labeled "H".

If choice c is selected set score to 1.

22. (1.5.3.2-1) Which pair of the illustrated service gauge manifold sets would require switching hoses when transitioning from a dehydration evacuation to refrigerant charging? Illustration GS-RA-30

- (a) A and B
- (b) B and D
- (c) C and D
- (d) D and A

If choice b is selected set score to 1.

23. (1.5.3.2-3) With a service gauge manifold set connected to a refrigerant compressor as shown in the illustration, which arrangement of the gauge manifold set valves and compressor Service Valves would allow for simultaneous reading of the compressor suction and discharge pressures? GS-RA-03

- (a) Valves "2" and "5" both open, along with valves "1" and "6" both open in the mid- position.
- (b) Valves "2" and "5" both closed, along with valves "1" and "6" both cracked open off their back-seats.
- (c) Valves "2" and "5" both open, along with valves "1" and "6" both front-seated.
- (d) Valves "2" and "5" both closed, along with valves "1" and "6" both back-seated.

If choice b is selected set score to 1.

24. (1.5.3.2.1-4) In a refrigeration system, once the gage manifold hoses are attached to the compressor service valve connections and properly purged, what should be the status of the manifold valves and the service valves when the purpose for attachment is to read system pressures?

- (a) both manifold hand valves should be closed and the compressor Service Valves should be cracked-off their back seats
- (b) both manifold hand valves should be open and the compressor Service Valves should be cracked-off their back seats
- (c) both manifold hand valves should be open and the compressor Service Valves should both be back-seated
- (d) both manifold hand valves should be open and the compressor Service Valves should both be front-seated

If choice a is selected set score to 1.

25. (1.5.3.2-5) When purging a refrigeration gage manifold using system pressure as the source of refrigerant for purging, which of the fittings listed is normally tightened LAST?

- (a) the high pressure hose fitting at the gage manifold high pressure connection
- (b) the low pressure hose fitting at the suction service valve service port
- (c) the low pressure hose fitting at the gage manifold low pressure connection
- (d) the high pressure hose fitting at the discharge service valve service port

If choice b is selected set score to 1.

26. (1.5.3.3.1-5) Before charging a refrigeration unit, unless quick disconnect fittings are used, the refrigerant charging hoses should be prepared in what way?

- (a) they should be flushed with clean refrigerant oil
- (b) they should be cleaned with carbon tetrachloride
- (c) they should be purged with refrigerant
- (d) they should be warmed in an oven

If choice c is selected set score to 1.

27. (1.5.3.3.1-7) The amount of HCFC-123 in a storage cylinder is measured by what means?

- (a) volume
- (b) saturation pressure
- (c) saturation temperature
- (d) weight

If choice d is selected set score to 1.

28. (1.5.3.3.1-3) In a refrigeration system, from what location would air and non-condensable gases be removed?

- (a) the top of the condenser purge connection
- (b) expansion valve equalizer connection
- (c) compressor oil fill connection
- (d) the bottom of the receiver drain connection

If choice a is selected set score to 1.

29. (1.5.3.3.1-4) Loss of refrigerant during the process of purging of air and non-condensable gases can be kept to a minimum by what action?

- (a) purging through the discharge service valve rather than the top of the condenser
- (b) purging through the top of the receiver rather than the top of the condenser
- (c) purging through a dehydrator
- (d) cracking the purge valve briefly and allowing the refrigerant to re-settle between purges

If choice d is selected set score to 1.

30. (1.5.3.3.1-6) Concerning the charging of refrigerant into a vapor compression refrigerating system, which of the following is true?

- (a) when charging as a liquid it should be to the low side only
- (b) when charging as a liquid it may be to the low or high side
- (c) when charging as a liquid it should be to the high side only
- (d) when charging as a vapor it should be directly to the receiver only

If choice c is selected set score to 1.

31. (1.5.3.3.2-2) How should small appliances with less than three pounds of refrigerant be charged with refrigerant?

- (a) vapor charged
- (b) either vapor or liquid charged
- (c) liquid charged
- (d) initially liquid charged and then topped with a vapor charge

If choice a is selected set score to 1.

32. (1.5.3.3.2-1) Which of the illustrated valves is used to gain access to a hermetic system and features a Schrader core valve which is unseated by the core depressor of hose fitting when attached? GS-RA-69

- (a) B
- (b) A
- (c) D
- (d) C

If choice c is selected set score to 1.

33. (1.5.3.3.2-3) If passive recovery is used on a small appliance fitted with a capillary tube as a metering device with a non-operating compressor, the recovery should be made through what means?

- (a) recovery from the low side only
- (b) by venting to atmosphere, cannot be recovered
- (c) recovery from both the high and low sides
- (d) recovery from the high side only

If choice c is selected set score to 1.

34. (1.5.3.3.3-2) In a low-pressure centrifugal chiller, what is meant by the term 'high efficiency purge unit?'

- (a) Those purge units which discharge very little refrigerant with the air being removed.
- (b) Those purge units which draw very little electrical power.
- (c) Those purge units which need the least amount of on-going Maintenance.
- (d) Those purge units which discharge the highest percentage of refrigerant with the air being removed.

If choice a is selected set score to 1.

35. (1.5.3.3.3-3) During normal operation, traditionally, how has most of the refrigerant released to the atmosphere from low pressure systems?

- (a) through a leaking rupture disk
- (b) through the purge unit vent
- (c) through the compressor shaft seal
- (d) through water-side system leaks

If choice b is selected set score to 1.

36. (1.5.3.3.3-4) Charging liquid HCFC-123 into a system under a deep vacuum could cause what to happen unless necessary precautions are taken?

- (a) air and moisture to enter the receiver
- (b) the purge unit to operate
- (c) system secondary refrigerant to freeze
- (d) rupture disk to rupture

If choice c is selected set score to 1.

37. (1.5.3.3.3-1) In a low pressure refrigeration system, excessive running of the purge recovery unit generally indicates which probable condition?

- (a) faulty purge system vent valve
- (b) system leaks on the low side
- (c) system leaks on the high side
- (d) overcharged system

If choice b is selected set score to 1.

38. (1.5.3.3.4-2) When a refrigeration system is being topped off with a small amount of refrigerant through the low side with the compressor running, what should be done?

- (a) the refrigerant charging cylinder should be turned upside down
- (b) the refrigerant should be charged into the system as a vapor
- (c) the suction service valve must be back seated
- (d) the discharge service valve must be front seated

If choice b is selected set score to 1.

39. (1.5.3.3.4-3) Which of the valves listed is normally closed when charging the refrigeration system through the high side?

- (a) Thermal expansion valve
- (b) Suction line valve
- (c) Liquid line king valve
- (d) Dehydrator inlet valve

If choice c is selected set score to 1.

40. (1.5.3.3.4-4) Using the device shown in the illustration, which of the following statements is true when adding refrigerant as a vapor to the low side of the refrigeration system. GS-RA-01

- (a) The hose labeled "H" should be connected to the suction service valve service port, the hose labeled "J" should be connected to the vapor valve on the refrigerant cylinder and the valve labeled "G" should be open.
- (b) The hose labeled "K" should be connected to the suction service valve service port, the hose labeled "J" should be connected to the vapor valve on the refrigerant cylinder and the valve labeled "C" should be closed.
- (c) The hose labeled "H" should be connected to the suction service valve service port, the hose labeled "J" should be connected to the vapor valve on the refrigerant cylinder and the valve labeled "G" should be closed.
- (d) The hose labeled "K" should be connected to the suction service valve service port, the hose labeled "J" should be connected to the vapor valve on the refrigerant cylinder and the valve labeled "C" should be closed.

If choice a is selected set score to 1.

41. (1.5.3.3.4-1) After the refrigerant has been recovered, leaks repaired if necessary, the system ideally should undergo a dehydration evacuation prior to recharging with refrigerant. As shown in the illustration, besides the vacuum pump suction manifold isolation valve being opened, what would be the proper valve positions to accomplish and prove the evacuation? GS-RA-51

- (a) Valves 1, 2, and 3 should be in the mid-position and the low-side gauge manifold hand valve should be closed, and the high-side gauge manifold hand valve should be open.
- (b) Valves 1, 2, and 3 should be in the mid-position and the low-side gauge manifold hand valve should be open, and the high-side gauge manifold hand valve should be closed.
- (c) Valves 1, 2, and 3 should be front-seated and both gauge manifold hand valves should be closed.
- (d) Valves 1, 2, and 3 should be back-seated and both gauge manifold hand valves should be open.

If choice a is selected set score to 1.

42. (1.5.3.4.1-7) In reclaiming recovered refrigerant, which type of contamination will the reclamation process be unable to separate?

- (a) moisture
- (b) acid
- (c) mixed refrigerants
- (d) air

If choice c is selected set score to 1.

43. (1.5.3.4.1-8) In a refrigeration system, the push-pull technique can be used for the recovery of the refrigerant in what state?

- (a) should never be used with low pressure systems
- (b) liquid only
- (c) vapor only
- (d) both liquid and vapor

If choice d is selected set score to 1.

44. (1.5.3.4.1-2) What must be done, at a minimum, before a system can legally be opened up for repairs while adhering to the prohibition against the venting of halogenated fluoro-carbon refrigerants to the atmosphere?

- (a) reclamation of the refrigerant
- (b) destruction of the refrigerant
- (c) recycling of the refrigerant
- (d) recovery of the refrigerant

If choice d is selected set score to 1.

45. (1.5.3.4.1-3) The process of removing refrigerant from a system and storing it without testing or processing it in any way is known as what under the EPA Clean Air Act rule definitions?

- (a) recovering
- (b) recouping
- (c) reclaiming
- (d) recycling

If choice a is selected set score to 1.

46. (1.5.3.4.1-5) What is the correct color coding of refrigerant recovery cylinders regardless of the refrigerant contained within?

- (a) gray top and light blue lower body
- (b) gray top and yellow lower body
- (c) yellow top and gray body
- (d) light blue top and yellow lower body

If choice c is selected set score to 1.

47. (1.5.3.4.2-1) Which recovery procedure should be used to minimize the loss of oil from the system during the recovery of refrigerant from small appliances such as a water cooler?

- (a) vapor-liquid recovery
- (b) vapor recovery
- (c) liquid recovery
- (d) initial recovery

If choice b is selected set score to 1.

48. (1.5.3.4.2-2) What is true concerning highly contaminated refrigerant recovered from burned out small appliances?

- (a) The recovered refrigerant should be sent to a designated reclamation facility for processing.
- (b) The recovered refrigerant may be blended with new refrigerant for eventual re-use.
- (c) The recovered refrigerant may be used to clean out systems that have suffered from a burn-out.
- (d) The recovered refrigerant must be destroyed by the refrigeration technician.

If choice a is selected set score to 1.

49. (1.5.3.4.2-3) Technicians servicing small refrigeration appliances can employ what type of recovery equipment?

- (a) passive only
- (b) do not need to recover the refrigerant
- (c) either active or passive
- (d) active only

If choice c is selected set score to 1.

50. (1.5.3.4.3-1) Minor repairs may be performed on low pressure refrigerant systems without recovering the refrigerant charge if the pressure in the system is raised to atmospheric. How may this be accomplished?

- (a) open the system vent to the atmosphere and allow the pressure to equalize
- (b) heat the refrigerant
- (c) pressurize the system with nitrogen
- (d) charge the system until it is completely filled with liquid refrigerant

If choice b is selected set score to 1.

51. (1.5.3.4.3-3) The most cost-effective method of recovering refrigerant from a low pressure chiller with more than 500 lbs of refrigerant and to meet EPA requirements is to recover the refrigerant using what protocol?

- (a) vapor recovery using a vacuum pump based recovery unit followed by liquid recovery using a liquid pump
- (b) recovery using a vacuum pump based vapor recovery machine only
- (c) recovering using a liquid pump only
- (d) liquid recovery using a liquid pump, followed by vapor recovery using a vacuum pump based recovery unit

If choice d is selected set score to 1.

52. (1.5.3.4.3-2) Why is a purge recovery unit typically fitted on low pressure centrifugal chillers?

- (a) such a chiller can operate at a pressure below atmospheric pressure on the low side thus drawing in air through any low-side leaks
- (b) low pressure chillers are routinely opened for Maintenance thus introducing air at each opening
- (c) low pressure chillers use extremely low boiling point refrigerants
- (d) evacuation of the air from a low pressure chiller prior to charging with refrigerant is not possible

If choice a is selected set score to 1.

53. (1.5.3.4.4-1) As shown in the illustrated flow diagram for a self-contained recovery unit designed for the recovery of refrigerants from high pressure appliances as defined by the EPA Clean Air Act rules, what is the functional purpose of the item labeled "FS2"? GS-RA-32

- (a) It automatically shuts down the recovery unit compressor when the recovery cylinder becomes 80% full.
- (b) It automatically transitions the recovery unit from the direct liquid recovery mode to the direct vapor recovery mode.
- (c) It automatically shuts down the recovery unit compressor when the discharge pressure becomes excessive.
- (d) It automatically shuts down the recovery unit compressor when the refrigeration system has reached a depth of 15" Hg.

If choice b is selected set score to 1.

54. (1.5.3.5-3) Concerning frost appearing on one set of evaporator coils of a multi-box, direct expansion type refrigeration system, what is true?

- (a) the frost can be quickly removed by simply shutting off fluid flow to the coils
- (b) the frost will assist in increasing the refrigeration effect
- (c) the frost will increase the value of superheat to the fluid leaving the coils
- (d) the frost can be removed by passing hot vapors through the coils

If choice d is selected set score to 1.

55. (1.5.3.5-2) What is true concerning frost build-up on the evaporator coils of a multi-box direct expansion refrigeration system?

- (a) the frost can be removed by passing hot gas through the coils or energizing defrost heaters with the evaporator fan shut down
- (b) the frost can be removed by passing hot gas through the coils or energizing defrost heaters with the evaporator fan still running
- (c) the frost can be quickly removed by simply shutting down the compressor
- (d) the frost will increase the refrigeration effect

If choice a is selected set score to 1.

56. (1.5.3.5-1) Some 'hot gas' defrost systems reheat the refrigerant just prior to its returning to the compressor for what purpose?

- (a) to increase the circulation of liquid refrigerant
- (b) to prevent the damaging effects of liquid slugging
- (c) to improve the efficiency of the expansion valve
- (d) to prevent chill shocking the compressor suction valves

If choice b is selected set score to 1.

57. (1.5.3.6-2) What is the maximum volume to which refillable refrigeration cylinders should be filled?

- (a) 90% full
- (b) 60% full
- (c) 70% full
- (d) 80% full

If choice d is selected set score to 1.

58. (1.5.3.6-1) The pressure in the part of a high pressure refrigeration system about to be opened for a non-major repair should be brought to what value?

- (a) 11 to 12 psig
- (b) 4 to 7 psig
- (c) 0 psig
- (d) 1 to 2 psig

If choice c is selected set score to 1.

59. (1.5.3.6-3) If the combination moisture indicator and sight glass indicates an accumulation of moisture within the system, which of the listed procedures would be the most practical to follow?

- (a) Secure the system, disassemble and de-ice the thermostatic expansion valve.
- (b) Using a vacuum pump, draw the entire system down to 1,270 microns for a period of three hours.
- (c) Close the king valve, pump down the system, isolate the drier, remove the desiccant core and replace with new drier cartridge.
- (d) Purge the entire system to the atmosphere, replace the drier cartridge, and recharge the system with refrigerant.

If choice c is selected set score to 1.

60. (1.5.3.7-2) In addition to the drive belt itself, a V-belt that is tensioned too tight will cause excessive wear to what other drive component?

- (a) the compressor drive pulley
- (b) the prime mover drive pulley
- (c) motor shaft and compressor main bearings
- (d) the shaft of the prime mover

If choice c is selected set score to 1.

61. (1.5.3.7-4) When one belt of a multiple V-belt drive requires replacing, what will be required?

- (a) ensure the seasoned belts are reinstalled in their proper sequence
- (b) season the new belt prior to installation
- (c) replace the entire belt set
- (d) ensure the proper belt dressing is applied

If choice c is selected set score to 1.

62. (1.5.3.7-7) Excessively tight drive belts installed between a motor and a refrigeration compressor pulley may cause what condition?

- (a) normal wear of the pulley end motor shaft bearing, but premature wear of the pulley end compressor crankshaft main bearing
- (b) premature wear of both the pulley end motor shaft bearing and the pulley end compressor crankshaft main bearing due to overloading
- (c) premature wear of the pulley end motor shaft bearing, but normal wear of the pulley end compressor crankshaft main bearing
- (d) premature wear of both motor shaft bearings and both compressor crankshaft main bearings due to belt slippage

If choice b is selected set score to 1.

63. (1.5.3.7-6) When installing a mechanical shaft seal on a refrigeration compressor, extreme care must be taken to prevent what from happening?

- (a) any lubricant from contacting the carbon surface that would cause the expulsion of the saturated Teflon film
- (b) any lubricant from contacting the stationary seal face that would cause etching of the face surface
- (c) the spring from being damaged by the corrosive effects of excessive handling
- (d) dirt and foreign particles from coming in contact with the highly polished sealing surfaces

If choice d is selected set score to 1.

64. (1.5.3.7-1) If the discharge reed valves used in a refrigeration compressor are leaking badly, what statement is true?

- (a) the reed valves should be reground and relapped
- (b) the low side pressure will indicate below normal
- (c) the high pressure cut-out setting should be lowered
- (d) the reed valves should be replaced

If choice d is selected set score to 1.

65. (1.5.3.8-1) The primary purpose of the liquid line strainer used in a refrigeration system is to prevent dirt and scale from entering what system component(s)?

- (a) condenser and receiver
- (b) evaporator coil piping
- (c) thermal expansion valves
- (d) compressor and oil separator

If choice c is selected set score to 1.

66. (1.5.3.8-2) Of the various possible methods shown in the illustration, which is the correct method of attaching a TXV feeler bulb to a small large line (7/8" and larger) with a horizontal run? GS-RA-50

- (a) A
- (b) C
- (c) D
- (d) B

If choice b is selected set score to 1.

67. (1.5.3.8-3) A thermostatic expansion valve is properly controlling evaporator superheat. Adjusting this valve to lower the evaporator superheat setting will result in which of the following?

- (a) the expansion valve will further close
- (b) the expansion valve diaphragm will rupture
- (c) the evaporator pressure will decrease
- (d) the evaporator feed will increase

If choice d is selected set score to 1.

68. (1.5.3.8-4) When replacing a thermostatic expansion valve power element, what is true concerning the thermal bulb?

- (a) with steel wool or an abrasive cloth remove oxidation on the bulb and suction line
- (b) carefully coat the device with silicone sealant to reduce the effects of convective cooling
- (c) apply a heavy coating of grease to function as a heat sink
- (d) apply a light film of oil to increase heat transfer

If choice a is selected set score to 1.

69. (1.5.3.8-5) If the evaporator coil horizontal return line of a container refrigeration system is less than 0.875" (2.21 cm) in diameter (considered small); the thermostatic expansion valve sensing bulb should be attached where on the return line?

- (a) on the upper surface of the line
- (b) directly below the point of maximum heat transfer
- (c) as close as possible to the expansion valve
- (d) on the bottom of the line to enable the bulb to absorb the maximum amount of heat

If choice a is selected set score to 1.

70. (1.5.4.1-2) An evaporator coil of a single evaporator, air cooled refrigerator is accumulating excessive frost due to a failure of the defrost mechanism. If the refrigerator features a thermostatically controlled box solenoid and a low pressure cutout controlled compressor, as well as a high pressure cutout, in terms of the compressor, what would be the most likely operating symptom?

- (a) short cycle on low pressure cutout
- (b) fail to start
- (c) short cycle on high pressure cutout
- (d) run continuously

If choice a is selected set score to 1.

71. (1.5.4.1-4) Concerning the operation of refrigeration systems, frosting or sweating of a liquid line is usually indicative of what condition?

- (a) high relative humidity surrounding the liquid line
- (b) the refrigerant contaminated with moisture
- (c) a liquid line restriction
- (d) proper cooling taking place

If choice c is selected set score to 1.

72. (1.5.4.1-3) If an abnormally large difference is maintained between the evaporator refrigerant temperature and the box air temperature within the refrigerated compartment, what will be the result?

- (a) the evaporator coil will tend to excessively frost
- (b) the box temperature will be pulled down too low
- (c) the compressor will tend to trip out on high head pressure
- (d) the compressor will tend to overheat due to high suction temperature

If choice a is selected set score to 1.

73. (1.5.4.2-4) What is the color of the flame produced by a halide torch when there is no halogenated refrigerant present at the location of the exploring tube?

- (a) purple
- (b) green
- (c) blue
- (d) orange

If choice c is selected set score to 1.

74. (1.5.4.2-9) To test for a suspected large refrigerant leak from an R-22 refrigeration system in an enclosed area, how should this be done?

- (a) perform a hydrostatic test with water
- (b) apply a soap solution to fittings seen to have oil residue
- (c) perform a standing vacuum test
- (d) use an electronic leak detector to check all fittings for leaks

If choice b is selected set score to 1.

75. (1.5.4.2-13) What must be done to use standard leak detection methods on a low pressure refrigeration system charged with refrigerant?

- (a) lower the pressure in the system below atmospheric
- (b) add nitrogen to the system
- (c) raise the pressure in the system above atmospheric
- (d) cool the refrigerant

If choice c is selected set score to 1.

76. (1.5.4.2-8) Which of the following statements is correct concerning the testing of an R-22 refrigeration system for leaks in an enclosed compartment with a halide torch?

- (a) Halide torches are not suitable for detecting R-22 leaks.
- (b) The flame of a halide torch will turn blue in the presence of R-22.
- (c) To gain sensitivity, the largest possible flame should be used with the halide torch.
- (d) Halide torches are useful in locating very small R-22 leaks.

If choice d is selected set score to 1.

77. (1.5.4.2-10) What is a quick method used to test a water cooled condenser for the presence of a refrigerant leak without actually pinpointing the actual location?

- (a) test the cooling water for proper pH
- (b) test the receiver for water content
- (c) check the drains on the condenser heads with a halide torch
- (d) test the condenser tubes hydrostatically

If choice c is selected set score to 1.

78. (1.5.4.3-1) Excessive moisture being collected in the purge unit of a low pressure refrigeration system could indicate which probable condition?

- (a) low efficiency purge unit
- (b) dryer core needs replacement
- (c) leaking condenser or chiller tubes
- (d) improper charging of refrigerant

If choice c is selected set score to 1.

79. (1.5.4.3-2) Moisture entering a typical refrigeration system will most likely produce what effect?

- (a) cause sweating and frost on the evaporator coils
- (b) freeze in the expansion valve
- (c) boil in the condenser
- (d) be removed by the liquid line strainers

If choice b is selected set score to 1.

80. (1.5.4.3-3) Moisture in a refrigeration system can cause which of the following conditions?

- (a) freezing the expansion valve closed
- (b) corrosion of system piping
- (c) hermetic motor burnout
- (d) all of the above

If choice d is selected set score to 1.

81. (1.5.4.4-14) If a refrigeration system were short of refrigerant, besides an elevated box temperature, what would be an observable symptom?

- (a) high suction pressure
- (b) continuous running of the compressor
- (c) short cycling of the compressor on the water failure switch
- (d) high discharge pressure

If choice b is selected set score to 1.

82. (1.5.4.4-1) High suction pressure accompanied by low suction temperature to a refrigeration system compressor is caused by which of the following?

- (a) the king valve is insufficiently open
- (b) the expansion valve is insufficiently opened
- (c) a clogged liquid-line strainer
- (d) the expansion valve being open too wide

If choice d is selected set score to 1.

83. (1.5.4.4-2) Which of the conditions listed could cause excessively low refrigerant pressure at the compressor suction of a TXV controlled refrigeration system?

- (a) The system is low on refrigerant.
- (b) The box solenoid valve 'stuck' in the open position.
- (c) The high pressure cutout switch is inoperative.
- (d) Insufficient flow of condenser cooling water.

If choice a is selected set score to 1.

84. (1.5.4.4-3) When a refrigeration compressor has developed a high head pressure as a result of a refrigerant overcharge, what should be done to compensate for or to correct this situation?

- (a) increase the amount of cooling water to the condenser
- (b) decrease the amount of cooling water to the condenser
- (c) remove some refrigerant from the system
- (d) raise the high pressure cut-out opening pressure

If choice c is selected set score to 1.

85. (1.5.4.4-4) Low compressor head pressure in a refrigeration system can be caused by which of the following?

- (a) insufficient condenser cooling water flow
- (b) air in the refrigeration system
- (c) excessive condenser cooling water flow
- (d) excessive refrigerant in the system

If choice c is selected set score to 1.

86. (1.5.4.5-1) Which of the following conditions will occur if the power element of the thermostatic expansion valve shown in the illustration loses its charge? GS-RA-07

- (a) The valve will begin to close, but the external equalizing line will assist in keeping the valve unseated.
- (b) The valve will fail open and the cooling capacity will be increased.
- (c) The valve will fail open as designed to provide continuous cooling.
- (d) The valve will fail closed, providing no cooling capacity.

If choice d is selected set score to 1.

87. (1.5.4.5-2) Which of the following statements describes the accepted method for testing a thermostatic expansion valve?

- (a) Chill the bulb in ice water while observing the compressor for an increase in suction pressure.
- (b) Remove the power head from the unit, heat the bulb with a torch while using a scale to measure the distance the diaphragm has moved.
- (c) Heat the bulb by using a halide torch or similar device and observe the valve stem movement.
- (d) Place the sensing bulb in ice water and then warm by hand. Observe flood-through and temperature change at the suction line.

If choice d is selected set score to 1.

88. (1.5.4.5-3) If the superheat setting of a thermostatic expansion valve is set too low, what would be the result, assuming that the system has a single evaporator?

- (a) the suction line will be abnormally warm due to a reduced amount of refrigerant returning back to the compressor
- (b) the suction line will be abnormally cold and liquid may flood back to the compressor
- (c) the receiver level will be abnormally high due to a reduced amount of refrigerant returning back to the compressor
- (d) the box temperature will be pulled way down below the normal temperature range

If choice b is selected set score to 1.

89. (1.5.4.5-4) If the superheat value of the thermostatic expansion valve is adjusted too high, what would be the result?

- (a) the suction line of the compressor will be abnormally warm
- (b) the heat removal capacity of the evaporator will increase
- (c) the evaporator will be overfed with liquid refrigerant
- (d) the suction line of the compressor will be abnormally cold

If choice a is selected set score to 1.

90. (1.5.4.5-5) A small obstruction at the thermostatic expansion valve inlet will result in which of the following conditions?

- (a) Lower than normal suction pressure.
- (b) Ice is the sole cause of this and will soon melt due to superheat; no adverse condition will occur.
- (c) Higher than normal discharge pressure.
- (d) Expansion valves are designed to pass small foreign particles so no adverse condition will occur.

If choice a is selected set score to 1.

91. (1.5.4.6-16) Excessive, prolonged oil foaming in the crankcase of a refrigeration compressor can result in what condition?

- (a) wax crystals forming in the thermal expansion valve
- (b) excessively high lube oil viscosity
- (c) carbon deposits on the compressor piston rings
- (d) overheated compressor bearings

If choice d is selected set score to 1.

92. (1.5.4.6-18) Which of the following conditions would indicate that the liquid line strainer in a refrigeration system has become excessively restricted and requires cleaning or replacement?

- (a) Noticeable temperature drop between the strainer inlet and the outlet tubing.
- (b) Frosting at the outlet of the receiver.
- (c) Frosting at the inlet of the compressor.
- (d) Excessively high suction pressure.

If choice a is selected set score to 1.

93. (1.5.4.6-1) You are checking the supply chilled water temperature thermistor probe on a high-pressure hermetic centrifugal chiller. Using the illustrated chart, what statement is true if the supply water temperature is verified 45 ° F with a digital thermometer? GS-RA-48

- (a) When checked with control power on and the thermistor probe isolated, the thermistor probe voltage drop should be 3.805 volts.
- (b) When checked with control power on and the thermistor probe connected into the circuit, the thermistor probe voltage drop should be 11.416 volts.
- (c) When checked with control power on and the thermistor probe connected into the circuit, the thermistor probe voltage drop should be 3.805 volts.
- (d) When checked with control power off and the thermistor probe isolated, the thermistor probe voltage drop should be 3.805 volts.

If choice c is selected set score to 1.

94. (1.5.4.6-15) If the compressor is heard to knock while pumping down the low side for repairs, but otherwise the compressor sounds normal; this is a possible indication of what condition?

- o (a) worn piston rings
- o (b) faulty bearings
- o (c) air being introduced to the system
- • (d) foaming of the crankcase oil

If choice d is selected set score to 1.

95. (1.5.4.6-13) Some refrigeration systems have chemical moisture indicators installed in conjunction with the sight glass in the liquid line. If excess moisture is present in the system, how will a typical moisture indicator respond?

- o (a) add a predetermined amount of liquid drying agent
- • (b) change color
- o (c) automatically cut in the driers
- o (d) secure the compressor

If choice b is selected set score to 1.

96. (1.5.5.1-5) If a liquid drying agent is used in a refrigeration system already equipped with a solid drying agent, the liquid drying agent will cause what type of reaction?

- • (a) it will release the moisture already trapped in the solid drying agent
- o (b) it will cause toxic gases to form in the refrigerated space
- o (c) it will react violently with the solid drying agent
- o (d) it will solidify the refrigerant oil in the compressor crankcase

If choice a is selected set score to 1.

97. (1.5.5.1-1) Why are dehydrators usually located in the liquid line of refrigeration systems?

- o (a) prevent liquid slugging in the suction line
- o (b) reduce compressor discharge line sweating
- o (c) remove oil from the refrigerant
- • (d) prevent icing of the expansion valve

If choice d is selected set score to 1.

98. (1.5.5.1-3) In a refrigeration system, silica gel is found in what component?

- o (a) condenser/receiver
- o (b) compressor suction scale trap
- • (c) dehydrator or combination filter/drier
- o (d) moisture indicating liquid line sight glass

If choice c is selected set score to 1.

99. (1.5.5.1-7) Standard filter/driers used in many commercial type refrigeration units may contain what type of substance?

- o (a) activated charcoal
- o (b) alcohol based liquid drying agents
- • (c) activated alumina or silica gel desiccant beads
- o (d) all of the above may be used

If choice c is selected set score to 1.

100. (1.5.5.1-2) Which of the devices listed will indicate whether or not a refrigeration system's dehydrator continues to be capable of removing moisture from the circulating refrigerant?

- • (a) Liquid line moisture indicating sight glass
- o (b) McLeod gage
- o (c) Dryer sensing bulb
- o (d) Particulate test

If choice a is selected set score to 1.

101. (1.5.5.2-1) Capacity control of a centrifugal refrigeration compressor can be accomplished by what means?

- o (a) varying the speed of the compressor
- o (b) varying the position of the suction inlet damper vanes
- o (c) varying the position of the hot gas bypass valve
- • (d) all of the above

If choice d is selected set score to 1.

102. (1.5.5.2-2) The fluid used as a source of actuating power against the underside of the unloader power element piston of the refrigeration compressor capacity control mechanism illustrated is obtained from where? GS-RA-13

- o (a) discharge of a secondary hydraulic pump specifically installed for this operation
- o (b) high side liquid receiver
- o (c) gas discharge from the compressor
- • (d) discharge of the compressor lube oil pump

If choice d is selected set score to 1.

103. (1.5.5.2-3) During operating periods of a multi-box refrigeration system using a capacity controlled compressor, when all of the evaporators of a four box plant are actively being fed with liquid refrigerant, the control oil pressure acting on the hydraulic relay piston will be at what value? GS-RA-13

- ○ (a) the lowest
- ○ (b) at its mid-range
- • (c) the highest
- ○ (d) of no consequence as the lube oil is not used in the operation of the unloader

If choice c is selected set score to 1.

104. (1.5.5.2-4) A refrigeration compressor used in a multi-box refrigeration system is designed with six of its eight cylinders able to be controlled for variable load conditions. If all of the reefer boxes are currently feeding, what percentage of the total number of compressor cylinders will be loaded after start up?

- ○ (a) 50%
- • (b) 100%
- ○ (c) 25%
- ○ (d) 0%

If choice b is selected set score to 1.

105. (1.5.5.2-5) On a modern refrigerated container unit employing suction modulation for the purposes of capacity control and capacity limitation, what happens when the applied voltage and current draw associated with the normally open (NO) suction modulation valve located in the suction line both increase?

- • (a) the valve will further close, raising evaporator pressure and lowering suction pressure
- ○ (b) the valve will further close, lowering evaporator pressure and raising suction pressure
- ○ (c) the valve will further open, lowering evaporator pressure and raising suction pressure
- ○ (d) the valve will further open, raising evaporator pressure and lowering suction pressure

If choice a is selected set score to 1.

106. (1.5.5.2-6) To prevent motor overload during start-up of a hermetically sealed centrifugal refrigeration system, what is true concerning the compressor suction gas variable inlet guide vanes?

- ○ (a) opened until the motor is connected across the line at full voltage and current drawn is up to full load current
- ○ (b) opened until the motor is connected across the line at full voltage and current drawn is below full load current
- • (c) closed until the motor is connected across the line at full voltage and current drawn is below full load current
- ○ (d) closed until the motor is connected across the line at full voltage and current drawn is up to full load current

If choice c is selected set score to 1.

107. (1.5.5.3-1) A box solenoid valve used in a refrigeration system should be installed in what manner?

- o (a) upright, controlled by a thermostat sensing the temperature of the box, and downstream of the thermal expansion valve
- o (b) with the axis of the solenoid horizontal, controlled by a thermostat sensing the temperature of the box, and upstream of the thermal expansion valve
- • (c) upright, controlled by a thermostat sensing the temperature of the box, and upstream of the thermal expansion valve
- o (d) upright, controlled by a thermostat sensing evaporator superheat, and upstream of the thermal expansion valve

If choice c is selected set score to 1.

108. (1.5.5.3-7) A box solenoid valve used in a multi-box refrigeration system is operated by electro-magnetic action by what control device?

- o (a) evaporator outlet temperature actuated thermostat
- o (b) discharge pressure actuated pressure switch
- o (c) suction pressure actuated pressure switch
- • (d) box temperature actuated thermostat

If choice d is selected set score to 1.

109. (1.5.5.3-2) In a multi-evaporator refrigeration system, a solenoid valve is installed in the liquid line prior to what device?

- o (a) the condenser
- o (b) the oil separator
- o (c) the receiver
- • (d) each expansion valve

If choice d is selected set score to 1.

110. (1.5.5.3-3) A liquid line solenoid valve controls refrigerant flow to the evaporator by what means?

- o (a) sensing the superheat in the tail coil
- • (b) fully opening or closing
- o (c) sensing the temperature in the liquid line
- o (d) throttling the refrigerant

If choice b is selected set score to 1.

111. (1.5.5.3-8) How does a refrigeration solenoid valve differ from a modulating valve?

- (a) Both valves operate in exactly the same manner, only the manufacturer's terminology is the differentiating factor.
- (b) A solenoid valve can only be installed in liquid lines.
- (c) Solenoid Valves are only used in low voltage refrigeration control systems, while modulation valves are used in high voltage applications.
- (d) A liquid line solenoid valve is either completely opened or closed, whereas a modulation valve is infinitely positioned according to the strength of the applied electrical signal.

If choice d is selected set score to 1.

112. (1.5.5.4-5) As shown in the illustrated refrigeration system piping schematic diagram with the various accessories and controls and equipped with an air-cooled condenser with high side pressure controls, what statement is true concerning the fan cycling control pressure switch? GS-RA-39

- (a) With a condenser fitted with a single fan driven by a single-speed electric motor, the fan would cycle off under high ambient temperature conditions.
- (b) With a condenser fitted with a single fan driven by a multi-speed electric motor, the fan speed would decrease under low ambient temperature conditions.
- (c) With a condenser fitted with multiple electric-motor driven fans, the number of fans in use would increase under low ambient temperature conditions.
- (d) With a condenser fitted with a single fan driven by a multi-speed electric motor, the fan speed would decrease under high ambient temperature conditions.

If choice b is selected set score to 1.

113. (1.5.5.4-2) In a refrigeration system that is not protected by a water failure switch, if the cooling water to the condenser fails, what will be the result for protective purposes?

- (a) the king valve will open
- (b) the box temperature solenoid valve will close initiating a pump down
- (c) the compressor will shut down by the action of the high pressure cutout switch
- (d) the expansion valve will close due to high superheat

If choice c is selected set score to 1.

114. (1.5.5.4-1) If it is necessary to increase the operating head pressure of the refrigeration system using the device shown in the illustration, what should be done? GS-RA-14

- (a) "4" should be rotated to compress the enclosed bellows
- (b) "2" should be turned to relax the compression of the spring
- (c) "2" should be turned to further compress the spring
- (d) "4" should be rotated to relax the enclosed bellows

If choice c is selected set score to 1.

115. (1.5.5.4-3) In a refrigeration system, the valve shown in the illustration is used for what purpose? GS-RA-14

- (a) head pressure regulating valve
- (b) suction pressure regulating valve
- (c) evaporator pressure regulating valve
- (d) thermostatic expansion valve

If choice a is selected set score to 1.

116. (1.5.5.4-4) The set point adjustment of the device shown in the illustration is made by rotating what component? GS-RA-14

- (a) "4"
- (b) "3"
- (c) "1"
- (d) "2"

If choice d is selected set score to 1.

117. (1.5.5.4-6) An arrow stamped on the valve body of a water regulating valve indicates which of the following?

- (a) closed position
- (b) direction of the flow
- (c) open position
- (d) direction of the plunger slide

If choice b is selected set score to 1.

118. (1.5.5.6-1) Through which of the components shown in the illustration is flash gas formation a normal occurrence? GS-RA-25

- (a) receiver tank
- (b) thermostatic expansion valve
- (c) evaporator coil
- (d) condenser coil

If choice b is selected set score to 1.

119. (1.5.5.6-2) In the multi-evaporator refrigeration system shown in the illustration, what is the proper name for the valve labeled "29"? GS-RA-12

- (a) freeze box thermostatic expansion valve
- (b) chill box evaporator pressure regulating valve
- (c) chill box thermostatic expansion valve
- (d) chill box solenoid valve

If choice c is selected set score to 1.

120. (1.5.5.6-3) Rather than design an infinite variety of thermostatic expansion valve sizes to accommodate different capacities for heat removal, some manufacturers use a few standard valve body sizes in conjunction with what other feature?

- (a) an externally adjustable superheat to accommodate different heat removal capacities
- (b) internal needle valve orifices of various sizes to accommodate different heat removal capacities
- (c) a flexible diaphragm to accommodate different heat removal capacities
- (d) internal equalizers to accommodate different heat removal capacities

If choice b is selected set score to 1.

121. (1.5.5.6-4) Constant superheat is maintained at the evaporator coil outlet of a refrigeration system or unit by the action of what device?

- (a) thermal expansion valve
- (b) low pressure cutout switch
- (c) king valve
- (d) solenoid valve

If choice a is selected set score to 1.

122. (1.5.5.6-5) Besides the evaporator pressure, the thermal expansion valve reacts directly to changes in what parameter?

- (a) temperature of the evaporator coil outlet
- (b) liquid refrigerant pressure at the solenoid valve
- (c) pressure drop across the evaporator coils
- (d) temperature of the space being cooled

If choice a is selected set score to 1.

123. (1.5.5.7-5) The receiver used in a refrigeration system performs what essential function?

- (a) allows the refrigerant to be superheated
- (b) holds the entire refrigerant charge after system pump down
- (c) prevents liquid refrigerant from flooding back to the compressor
- (d) collects air and non-condensable gases

If choice b is selected set score to 1.

124. (1.5.5.7-1) Refrigeration system isolation valves are specially designed with a back-seat, as well as a front-seat. For what purpose are these valves designed in this way?

- (a) permit repacking the valve stem under pressure without shutting down
- (b) allow for operation as a suction or discharge valve
- (c) allow for operation as a liquid or vapor valve
- (d) allow for removal and replacement of the valve without shutting down

If choice a is selected set score to 1.

125. (1.5.5.7-4) In addition to the indicated gauge pressure, what other information is presented on the compound gauge for the hypothetical refrigerant illustrated? GS-RA-16

- (a) the saturation temperature of the refrigerant that corresponds to the gauge pressure at the point of measurement
- (b) the metric pressure equivalent of the refrigerant at the point of measurement
- (c) the absolute pressure of the refrigerant at the point of measurement
- (d) the actual temperature of the refrigerant at the point of measurement

If choice a is selected set score to 1.

126. (1.5.5.7-2) Which lettered component, shown in the illustration, indicates the location of the receiver? GS-RA-12

- (a) A
- (b) B
- (c) F
- (d) C

If choice d is selected set score to 1.

127. (1.5.5.7-3) In a refrigeration plant, what is one vital purpose of the receiver?

- (a) superheat the refrigerant liquid
- (b) store the refrigerant charge
- (c) condense the refrigerant
- (d) cool the refrigerant gas

If choice b is selected set score to 1.

128. (1.5.5.8-1) During the initial cooling down of a box temperature in a refrigeration system, which of the devices listed is used to prevent excessive gas pressure at the compressor suction for the purpose of prevention of overloading of the compressor driver?

- (a) Crankcase pressure regulator
- (b) High pressure cutout
- (c) Solenoid valve
- (d) Low pressure cutout

If choice a is selected set score to 1.

129. (1.5.5.8-3) The rupture disc on a low pressure centrifugal refrigeration unit is used as an over pressure protection device and is set to relieve at 15 psig and is most likely to lift when the compressor is idle? Where is the rupture disc located?

- (a) at the top of the upper chamber of the economizer
- (b) on top of chiller evaporator shell
- (c) at the discharge of the compressor
- (d) on top of the condenser shell

If choice b is selected set score to 1.

130. (1.5.5.8-2) Which of the lettered components shown in the illustration indicates the high pressure cutout? GS-RA-12

- ○ (a) Y
- • (b) X
- ○ (c) Z
- ○ (d) W

If choice b is selected set score to 1.

131. (1.5.5.8-4) When the relief valve opens on a refrigeration compressor discharge line, it discharges high pressure refrigerant vapor to what location?

- ○ (a) liquid strainer
- • (b) suction side of the compressor
- ○ (c) inlet side of the evaporator
- ○ (d) refrigerant inlet of the condenser

If choice b is selected set score to 1.

132. (1.5.6-1) The safety heads of most large reciprocating compressors used in refrigeration systems are held in place by what means?

- ○ (a) large Teflon gaskets
- ○ (b) tack welding on the sides
- ○ (c) discharge pressure in the relief valve return line
- • (d) heavy coil springs

If choice d is selected set score to 1.

133. (1.5.6-2) In the illustrated refrigeration system, what is the proper name for the component labeled "A"? GS-RA-12

- ○ (a) condenser
- ○ (b) accumulator
- ○ (c) filter drier
- • (d) compressor

If choice d is selected set score to 1.

134. (1.5.6-3) What is the purpose of running a refrigeration compressor in short intermittent spurts or throttling the suction isolation valve when starting the system after a prolonged shutdown?

- • (a) prevent liquid slugging or overloading the compressor
- ○ (b) determine actual compressor oil level
- ○ (c) let the refrigerated compartment cool gradually
- ○ (d) allow refrigerant vapor cycling time

If choice a is selected set score to 1.

135. (1.5.6-4) A device used to hold open the refrigeration compressor suction valve during starting to reduce the compression load is called what?

- (a) cylinder unloader
- (b) discharge line bypass
- (c) suction line bypass
- (d) relief valve

If choice a is selected set score to 1.

136. (1.5.7-1) In a refrigeration system, what component is installed directly downstream of the thermal expansion valve?

- (a) box solenoid valve
- (b) evaporator coil
- (c) receiver
- (d) compressor

If choice b is selected set score to 1.

137. (1.5.7-2) Refrigeration systems using forced air circulation evaporators have a tendency to cause rapid dehydration of produce in chill boxes. Which of the following will minimize this dehydration?

- (a) the air is circulated rapidly over a small evaporator with a minimum temperature differential
- (b) the air is circulated rapidly over a small evaporator with a maximum temperature differential
- (c) the air is circulated slowly over a large evaporator with a maximum temperature differential
- (d) the air is circulated slowly over a large evaporator with a minimum temperature differential

If choice d is selected set score to 1.

138. (1.5.7-3) In a dry-type direct expansion refrigeration evaporator, what is true concerning the evaporator coils?

- (a) the coils are surrounded on the outside by refrigerant
- (b) the coils are surrounded on the outside by air
- (c) the coils are covered on the outside with insulation
- (d) the coils are coated on the inside with insulation

If choice b is selected set score to 1.

139. (1.5.8-2) Zinc plates commonly found in refrigeration systems and used as sacrificial anodes are located where?

- (a) cooling water suction strainer
- (b) saltwater side of the condenser
- (c) refrigerant side of the condenser
- (d) evaporator coils

If choice b is selected set score to 1.

140. (1.5.8-3) Seawater or low temperature central fresh water is typically provided to a ship's stores refrigeration plant for what purpose?

- ○ (a) prevent motor overheating
- • (b) condense the refrigerant gas
- ○ (c) cool the expansion valve
- ○ (d) prevent refrigerant superheating

If choice b is selected set score to 1.

141. (1.5.8-4) Heat is removed from the refrigerant circulating through the refrigeration system, shown in the illustration, by which component? GS-RA-12

- • (a) B
- ○ (b) A
- ○ (c) K
- ○ (d) J

If choice a is selected set score to 1.

142. (1.5.8-1) If a condenser coil of an air-cooled container refrigeration system becomes dirty and requires cleaning, what would be an acceptable method of cleaning?

- ○ (a) 'Binks' gun with weak acid solvent
- • (b) high pressure water wash
- ○ (c) copper wire rotary brush
- ○ (d) all of the above

If choice b is selected set score to 1.

143. (1.5.8-5) When checking zinc plates, or pencil Zincs in the refrigerating system condenser, what should you do?

- ○ (a) paint and insulate the plates to prevent corrosion
- ○ (b) file the plates to change the negative value
- • (c) replace the Zincs if deteriorated by 50%
- ○ (d) renew the plates at each inspection

If choice c is selected set score to 1.

144. (1.5.9-1) For safe storage, the maximum allowable temperature to which refrigerant bottles should be exposed is what temperature?

- • (a) 125°F
- ○ (b) 100°F
- ○ (c) 150°F
- ○ (d) 175°F

If choice a is selected set score to 1.

145. (1.5.9-8) If there is a "large" release of R-134a refrigerant gas in a confined area, which of the following statements would be true?

- ○ (a) safety goggles and lined butyl gloves would be required before entering the space
- ○ (b) an explosive atmosphere would be created
- • (c) a self-contained breathing apparatus (SCBA) would be required before entering the space
- ○ (d) dust or particle masks would be required before entering the space

If choice c is selected set score to 1.

146. (1.5.9-5) Personnel servicing refrigeration systems and subject to the exposure to commonly used refrigerants should wear what type of personal protective equipment?

- ○ (a) an all purpose gas mask
- • (b) goggles and gloves
- ○ (c) rubber soled shoes
- ○ (d) a respirator

If choice b is selected set score to 1.

147. (1.5.9-6) Inhalation of high concentrations of chlorofluorocarbon refrigerants (CFCs) may have which of the following effects?

- ○ (a) drowsiness
- ○ (b) loss of concentration
- ○ (c) cardiac arrhythmia's
- • (d) all of the above

If choice d is selected set score to 1.

148. (1.5.9-4) The FIRST thing to do to ensure that a refrigeration unit will not start while undergoing repairs is to do what?

- ○ (a) inform all persons in the area not to start the unit
- ○ (b) place a crow bar in the flywheel of the unit
- ○ (c) make a log book entry
- • (d) secure and tag the electrical circuit

If choice d is selected set score to 1.

149. (1.5.9-2) Which of the precautions listed should be taken before opening any part of a refrigeration system for the purpose of accomplishing non-major repairs?

- ○ (a) Bring the part of the system to be opened to a pressure corresponding to the ambient temperature.
- ○ (b) Use the hot gas defrost line to remove any frost on the evaporator coils.
- • (c) Bring the part of the system to be opened to 0 psig.
- ○ (d) Set the high pressure cutout on manual to prevent automatic starting.

If choice c is selected set score to 1.

150. (1.5.9-9) Why can CFC or HCFC refrigerants leaking into a confined space or in limited surroundings cause suffocation?

- (a) Refrigerants are heavier than air and displace oxygen.
- (b) Refrigerants lighter than air will rise.
- (c) Refrigerants obnoxious odor prevents breathing.
- (d) Refrigerants contain an acidic substance.

If choice a is selected set score to 1.

151. (1.5.9-3) Overfilling a refrigerant container is extremely dangerous because of the high pressures generated. The generation of pressure is the result of what?

- (a) hydrostatic pressure of the expanding liquid
- (b) vapor pressure of the refrigerant at saturation temperature
- (c) discharge pressure from the recovery cylinder
- (d) discharge pressure of the recovery compressor

If choice a is selected set score to 1.

152. (1.5.9-7) In the presence of an open flame or hot surfaces, chlorinated fluorocarbon refrigerants decomposes and form what chemical substance?

- (a) water vapor
- (b) petroleum crystals
- (c) carbon monoxide
- (d) phosgene gas

If choice d is selected set score to 1.

1. (2.4.1-1) Traditionally, which of the listed refrigerants has been more suitable than the others for use in a centrifugal refrigeration compressor?

- ○ (a) R-12
- ○ (b) Carbon dioxide
- ○ (c) Ammonia
- • (d) R-11

If choice d is selected set score to 1.

2. (2.4.1-2) Which of the fluids listed is suitable for use as a secondary refrigerant?

- ○ (a) Carbon dioxide
- ○ (b) Methyl alcohol
- • (c) Brine
- ○ (d) Cuprous chloride

If choice c is selected set score to 1.

3. (2.4.1-3) Alkylbenzene ISO 32 cSt synthetic refrigerant oil is miscible and suitable to use with which of the following refrigerants?

- ○ (a) R-32
- ○ (b) R-143a
- • (c) R-22
- ○ (d) R-134a

If choice c is selected set score to 1.

4. (2.4.1-4) The amount of HCFC-123 in a storage cylinder is measured by what means?

- ○ (a) saturation pressure
- ○ (b) volume
- • (c) weight
- ○ (d) saturation temperature

If choice c is selected set score to 1.

5. (2.4.1-5) Which of the following substances is normally classified as a low pressure refrigerant?

- • (a) R-123
- ○ (b) R-22
- ○ (c) R-12
- ○ (d) R-134A

If choice a is selected set score to 1.

6. (2.4.1-6) What is the color coding for a storage container of R-134a refrigerant?

- (a) green
- (b) purple
- (c) light blue
- (d) grey

If choice c is selected set score to 1.

7. (2.4.1-7) The gas that exists in the stratosphere forming a protective shield that helps to protect the environment from the harmful effects ultraviolet radiation is called what?

- (a) radon
- (b) ozone
- (c) oxygen
- (d) nitrogen

If choice b is selected set score to 1.

8. (2.4.1-8) The "tare weight" of a refrigerant storage cylinder refers to what weight?

- (a) the total weight of a fully charged cylinder
- (b) the weight of an empty cylinder
- (c) the weight of a cylinder AND its current contents
- (d) the maximum weight of the refrigerant allowed

If choice b is selected set score to 1.

9. (2.4.2-1) The term 'oil foaming' in refrigeration practice, is used to describe what event?

- (a) release of miscible refrigerant from the lubricant in the crankcase
- (b) release of dissolved lubricant from the refrigerant in the crankcase
- (c) sudden evaporation of entrapped moisture from the crankcase lubricant
- (d) sudden evaporation of entrapped air from the refrigerant liquid

If choice a is selected set score to 1.

10. (2.4.2-2) What is the physical state and pressure condition of refrigerant as it enters the condenser of a typical refrigeration system?

- (a) low pressure vapor
- (b) low pressure liquid
- (c) high pressure vapor
- (d) high pressure liquid

If choice c is selected set score to 1.

11. (2.4.2-3) What is the physical state and pressure condition of refrigerant as it leaves a receiver in a typical refrigeration system?

- ○ (a) high pressure vapor
- • (b) high pressure liquid
- ○ (c) low pressure vapor
- ○ (d) low pressure liquid

If choice b is selected set score to 1.

12. (2.4.2-4) What is the pressure and condition of the refrigerant entering the receiver of a refrigeration system?

- ○ (a) superheated low pressure vapor
- ○ (b) superheated high pressure vapor
- ○ (c) sub cooled low pressure liquid
- • (d) sub cooled high pressure liquid

If choice d is selected set score to 1.

13. (2.4.3.1-1) The safety heads of most large reciprocating compressors used in refrigeration systems are held in place by what means?

- ○ (a) tack welding on the sides
- • (b) heavy coil springs
- ○ (c) discharge pressure in the relief valve return line
- ○ (d) large Teflon gaskets

If choice b is selected set score to 1.

14. (2.4.3.1-2) In the illustrated refrigeration system, what is the proper name for the component labeled "A"? GS-RA-12

- ○ (a) accumulator
- • (b) compressor
- ○ (c) condenser
- ○ (d) filter drier

If choice b is selected set score to 1.

15. (2.4.3.1-3) A device used to hold open the refrigeration compressor suction valve during starting to reduce the compression load is called what?

- • (a) cylinder unloader
- ○ (b) relief valve
- ○ (c) suction line bypass
- ○ (d) discharge line bypass

If choice a is selected set score to 1.

16. (2.4.3.1-4) The carbon seal ring of a refrigeration compressor crankshaft mechanical seal is held in position against the stationary ring face by using what device?

- ○ (a) snap ring
- ○ (b) woodruff key
- • (c) spring
- ○ (d) thrust washer

If choice c is selected set score to 1.

17. (2.4.3.1-5) What is the drive arrangement of refrigeration compressor shown in figure "B" of the illustration? GS-RA-41

- • (a) welded, fully hermetic
- ○ (b) external-drive
- ○ (c) open
- ○ (d) serviceable, bolted, accessible semi-hermetic

If choice a is selected set score to 1.

18. (2.4.3.2-1) If the discharge reed valves used in a refrigeration compressor are leaking badly, what statement is true?

- ○ (a) the reed valves should be reground and relapped
- • (b) the reed valves should be replaced
- ○ (c) the low side pressure will indicate below normal
- ○ (d) the high pressure cut-out setting should be lowered

If choice b is selected set score to 1.

19. (2.4.3.2-2) In addition to the drive belt itself, a V-belt that is tensioned too tight will cause excessive wear to what other drive component?

- ○ (a) the compressor drive pulley
- • (b) motor shaft and compressor main bearings
- ○ (c) the shaft of the prime mover
- ○ (d) the prime mover drive pulley

If choice b is selected set score to 1.

20. (2.4.3.2-3) When one belt of a multiple V-belt drive requires replacing, what will be required?

- ○ (a) ensure the proper belt dressing is applied
- • (b) replace the entire belt set
- ○ (c) season the new belt prior to installation
- ○ (d) ensure the seasoned belts are reinstalled in their proper sequence

If choice b is selected set score to 1.

21. (2.4.3.2-5) Excessively tight drive belts installed between a motor and a refrigeration compressor pulley may cause what condition?

- (a) premature wear of the pulley end motor shaft bearing, but normal wear of the pulley end compressor crankshaft main bearing
- (b) premature wear of both motor shaft bearings and both compressor crankshaft main bearings due to belt slippage
- (c) premature wear of both the pulley end motor shaft bearing and the pulley end compressor crankshaft main bearing due to overloading
- (d) normal wear of the pulley end motor shaft bearing, but premature wear of the pulley end compressor crankshaft main bearing

If choice c is selected set score to 1.

22. (2.4.3.2-4) When installing a mechanical shaft seal on a refrigeration compressor, extreme care must be taken to prevent what from happening?

- (a) dirt and foreign particles from coming in contact with the highly polished sealing surfaces
- (b) any lubricant from contacting the carbon surface that would cause the expulsion of the saturated Teflon film
- (c) any lubricant from contacting the stationary seal face that would cause etching of the face surface
- (d) the spring from being damaged by the corrosive effects of excessive handling

If choice a is selected set score to 1.

23. (2.4.3.3-2) A reciprocating refrigeration compressor may be tested for leaking discharge valves by stopping the compressor, turning the discharge service valve all the way in, and then turning the compressor over by hand. If the discharge valves are leaking, the compound gage will show pressures which react in which way?

- (a) decreasing to a vacuum
- (b) increasing with each stroke
- (c) rising and falling with each stroke
- (d) decreasing with each stroke

If choice c is selected set score to 1.

24. (2.4.3.3-3) Unusual noise coming from a refrigeration compressor can be caused by which of the following conditions?

- (a) worn bearings and piston pins
- (b) slugging due to flooding back
- (c) too much oil in circulation
- (d) all of the above

If choice d is selected set score to 1.

25. (2.4.3.3-1) Which of the listed statements describes the reason why oil foaming occurs when starting a refrigeration compressor?

- (a) This phenomenon is inherent only in hermetically sealed units and is always provisional.
- (b) This condition is the result of the sudden low pressure created in the crankcase at start up causing the release of refrigerant absorbed within the oil.
- (c) If the oil level is not initially high, this condition is the result of agitation created by the movement of the mechanical components.
- (d) This will occur only if crankcase heaters are used.

If choice b is selected set score to 1.

26. (2.4.3.3-4) Leaking suction valves in a refrigeration compressor are indicated by which of the following?

- (a) noticeable increase in compressor noise
- (b) higher than normal suction pressure
- (c) lower than normal suction pressure
- (d) lower than normal evaporator temperature

If choice b is selected set score to 1.

27. (2.4.4.1-6) If a liquid drying agent is used in a refrigeration system already equipped with a solid drying agent, the liquid drying agent will cause what type of reaction?

- (a) it will solidify the refrigerant oil in the compressor crankcase
- (b) it will cause toxic gases to form in the refrigerated space
- (c) it will release the moisture already trapped in the solid drying agent
- (d) it will react violently with the solid drying agent

If choice c is selected set score to 1.

28. (2.4.4.1-2) Why are dehydrators usually located in the liquid line of refrigeration systems?

- (a) reduce compressor discharge line sweating
- (b) prevent icing of the expansion valve
- (c) prevent liquid slugging in the suction line
- (d) remove oil from the refrigerant

If choice b is selected set score to 1.

29. (2.4.4.1-4) In a refrigeration system, silica gel is found in what component?

- (a) dehydrator or combination filter/drier
- (b) condenser/receiver
- (c) moisture indicating liquid line sight glass
- (d) compressor suction scale trap

If choice a is selected set score to 1.

30. (2.4.4.1-8) Standard filter/driers used in many commercial type refrigeration units may contain what type of substance?

- ○ (a) activated charcoal
- ○ (b) alcohol based liquid drying agents
- • (c) activated alumina or silica gel desiccant beads
- ○ (d) all of the above may be used

If choice c is selected set score to 1.

31. (2.4.4.1-3) Which of the devices listed will indicate whether or not a refrigeration system's dehydrator continues to be capable of removing moisture from the circulating refrigerant?

- ○ (a) Particulate test
- ○ (b) McLeod gage
- ○ (c) Dryer sensing bulb
- • (d) Liquid line moisture indicating sight glass

If choice d is selected set score to 1.

32. (2.4.4.1-7) Moisture is removed from a refrigeration system by what action?

- • (a) cutting in the dehydrator
- ○ (b) condensing the water in the heat exchanger
- ○ (c) draining refrigerant from the bottom of the condenser
- ○ (d) opening a drain petcock on the oil separator

If choice a is selected set score to 1.

33. (2.4.4.1-5) The device shown in the illustration which is used for removing moisture from the liquid refrigerant in the system is labeled with what letter? GS-RA-12

- • (a) E
- ○ (b) C
- ○ (c) B
- ○ (d) D

If choice a is selected set score to 1.

34. (2.4.4.1-10) Which of the following dehydrators or combination filter/driers features a core that can be replaced when the desiccant becomes saturated with moisture? GS-RA-10

- ○ (a) B
- ○ (b) D
- • (c) A
- ○ (d) C

If choice c is selected set score to 1.

35. (2.4.4.1-1) For most multi-box refrigeration systems, the refrigerant sight glass would be located where in the system?

- ○ (a) after the condenser in the drain line to the receiver
- • (b) after the receiver in the liquid line
- ○ (c) before the compressor in the suction line
- ○ (d) after the compressor in the discharge line

If choice b is selected set score to 1.

36. (2.4.4.1-11) A liquid indicator sight glass is useful in determining whether or not a refrigeration system is sufficiently charged. Where is it generally located in the system?

- ○ (a) low pressure liquid line
- • (b) high pressure liquid line
- ○ (c) low pressure vapor line
- ○ (d) high pressure vapor line

If choice b is selected set score to 1.

37. (2.4.4.1-9) The primary purpose of the liquid line strainer used in a refrigeration system is to prevent dirt and scale from entering what system component(s)?

- ○ (a) evaporator coil piping
- • (b) thermal expansion valves
- ○ (c) compressor and oil separator
- ○ (d) condenser and receiver

If choice b is selected set score to 1.

38. (2.4.4.2-3) Capacity control of a centrifugal refrigeration compressor can be accomplished by what means?

- ○ (a) varying the speed of the compressor
- ○ (b) varying the position of the suction inlet damper vanes
- ○ (c) varying the position of the hot gas bypass valve
- • (d) all of the above

If choice d is selected set score to 1.

39. (2.4.4.2-4) The fluid used as a source of actuating power against the underside of the unloader power element piston of the refrigeration compressor capacity control mechanism illustrated is obtained from where? GS-RA-13

- • (a) discharge of the compressor lube oil pump
- ○ (b) gas discharge from the compressor
- ○ (c) high side liquid receiver
- ○ (d) discharge of a secondary hydraulic pump specifically installed for this operation

If choice a is selected set score to 1.

40. (2.4.4.2-5) During operating periods of a multi-box refrigeration system using a capacity controlled compressor, when all of the evaporators of a four box plant are actively being fed with liquid refrigerant, the control oil pressure acting on the hydraulic relay piston will be at what value?

- (a) the lowest
- (b) at its mid-range
- (c) the highest
- (d) of no consequence as the lube oil is not used in the operation of the unloader

If choice c is selected set score to 1.

41. (2.4.4.2-6) A refrigeration compressor used in a multi-box refrigeration system is designed with six of its eight cylinders able to be controlled for variable load conditions. If all of the reefer boxes are currently feeding, what percentage of the total number of compressor cylinders will be loaded after start up?

- (a) 0%
- (b) 100%
- (c) 25%
- (d) 50%

If choice b is selected set score to 1.

42. (2.4.4.2-1) On a modern refrigerated container unit employing suction modulation for the purposes of capacity control and capacity limitation, what happens when the applied voltage and current draw associated with the normally open (NO) suction modulation valve located in the suction line both increase?

- (a) the valve will further close, lowering evaporator pressure and raising suction pressure
- (b) the valve will further close, raising evaporator pressure and lowering suction pressure
- (c) the valve will further open, lowering evaporator pressure and raising suction pressure
- (d) the valve will further open, raising evaporator pressure and lowering suction pressure

If choice b is selected set score to 1.

43. (2.4.4.2-2) To prevent motor overload during start-up of a hermetically sealed centrifugal refrigeration system, what is true concerning the compressor suction gas variable inlet guide vanes?

- (a) opened until the motor is connected across the line at full voltage and current drawn is up to full load current
- (b) opened until the motor is connected across the line at full voltage and current drawn is below full load current
- (c) closed until the motor is connected across the line at full voltage and current drawn is up to full load current
- (d) closed until the motor is connected across the line at full voltage and current drawn is below full load current

If choice d is selected set score to 1.

44. (2.4.4.3-10) A box solenoid valve used in a multi-box refrigeration system is operated by electro-magnetic action by what control device?

- (a) box temperature actuated thermostat
- (b) discharge pressure actuated pressure switch
- (c) suction pressure actuated pressure switch
- (d) evaporator outlet temperature actuated thermostat

If choice a is selected set score to 1.

45. (2.4.4.3-5) In a multi-evaporator refrigeration system, a solenoid valve is installed in the liquid line prior to what device?

- (a) the receiver
- (b) each expansion valve
- (c) the oil separator
- (d) the condenser

If choice b is selected set score to 1.

46. (2.4.4.3-6) A liquid line solenoid valve controls refrigerant flow to the evaporator by what means?

- (a) fully opening or closing
- (b) sensing the temperature in the liquid line
- (c) throttling the refrigerant
- (d) sensing the superheat in the tail coil

If choice a is selected set score to 1.

47. (2.4.4.3-11) How does a refrigeration solenoid valve differ from a modulating valve?

- (a) Both valves operate in exactly the same manner, only the manufacturer's terminology is the differentiating factor.
- (b) A liquid line solenoid valve is either completely opened or closed, whereas a modulation valve is infinitely positioned according to the strength of the applied electrical signal.
- (c) Solenoid Valves are only used in low voltage refrigeration control systems, while modulation valves are used in high voltage applications.
- (d) A solenoid valve can only be installed in liquid lines.

If choice b is selected set score to 1.

48. (2.4.4.3-13) Which of the following electrically operated refrigeration system valves would be most appropriate for use as a 2 position diverting hot gas bypass solenoid valve? GS-RA-19

- (a) B
- (b) D
- (c) C
- (d) A

If choice a is selected set score to 1.

49. (2.4.4.3-8) In a refrigeration system featuring low-side pump down prior to the automatic shut down of the compressor, the temperature of the refrigerated space is controlled by the action of a thermostat wired to what device?

- o (a) suction line solenoid
- o (b) thermostatic expansion valve
- o (c) low pressure cutout switch
- • (d) liquid line box solenoid

If choice d is selected set score to 1.

50. (2.4.4.3-7) The thermostat controlling the operation of the solenoid valve to a refrigerated box evaporator senses what temperature?

- • (a) the refrigerated box temperature
- o (b) compressor discharge temperature
- o (c) evaporator coil outlet temperature
- o (d) evaporator coil inlet temperature

If choice a is selected set score to 1.

51. (2.4.4.3-9) Which of the following statements is true? GS-RA-12

- • (a) Valve "14" is the king solenoid, valve "28" is the chill box solenoid, and valve "36" is the freeze box solenoid.
- o (b) Valve "14" is the king solenoid, valves "28" and "36" are both freeze box solenoids.
- o (c) Valve "14" is the king solenoid, valve "36" is the chill box solenoid, and valve "28" is the freeze box solenoid.
- o (d) Valve "14" is the king solenoid, valves "28" and "36" are both chill box solenoids.

If choice a is selected set score to 1.

52. (2.4.4.3-12) A container unit's microprocessor-controlled temperature controller is set at -28.9 ° C, appropriate for a frozen cargo of ice cream. In this mode of operation, according to the illustrated temperature controller functional diagrams, what should be the operational status of the unit if the actual box temperature is -18.0 ° C? GS-RA-035

- o (a) heating mode
- o (b) modulating cooling mode
- o (c) air circulation mode
- • (d) cooling mode

If choice d is selected set score to 1.

53. (2.4.4.3-1) What is the purpose of the low pressure cut-out switch as used as a primary controller for a refrigeration system or unit?

- (a) start and stop the compressor as needed
- (b) control the capacity of the compressor
- (c) maintain a preset suction pressure to the compressor
- (d) maintain a preset low-side pressure for the system

If choice a is selected set score to 1.

54. (2.4.4.4-2) As shown in the illustrated refrigeration system piping schematic diagram with the various accessories and controls and equipped with an air-cooled condenser with high side pressure controls, what statement is true concerning the fan cycling control pressure switch? GS-RA-39

- (a) With a condenser fitted with multiple electric-motor driven fans, the number of fans in use would increase under low ambient temperature conditions.
- (b) With a condenser fitted with a single fan driven by a multi-speed electric motor, the fan speed would decrease under high ambient temperature conditions.
- (c) With a condenser fitted with a single fan driven by a multi-speed electric motor, the fan speed would decrease under low ambient temperature conditions.
- (d) With a condenser fitted with a single fan driven by a single-speed electric motor, the fan would cycle off under high ambient temperature conditions.

If choice c is selected set score to 1.

55. (2.4.4.4-1) If it is necessary to increase the operating head pressure of the refrigeration system using the device shown in the illustration, what should be done? GS-RA-14

- (a) "4" should be rotated to relax the enclosed bellows
- (b) "4" should be rotated to compress the enclosed bellows
- (c) "2" should be turned to further compress the spring
- (d) "2" should be turned to relax the compression of the spring

If choice c is selected set score to 1.

56. (2.4.4.4-3) In a refrigeration system, the valve shown in the illustration is used for what purpose? GS-RA-14

- (a) suction pressure regulating valve
- (b) thermostatic expansion valve
- (c) head pressure regulating valve
- (d) evaporator pressure regulating valve

If choice c is selected set score to 1.

57. (2.4.4.4-4) The set point adjustment of the device shown in the illustration is made by rotating what component? GS-RA-14

- (a) "3"
- (b) "1"
- (c) "4"
- (d) "2"

If choice d is selected set score to 1.

58. (2.4.4.4-5) An arrow stamped on the valve body of a water regulating valve indicates which of the following?

- (a) closed position
- (b) direction of the flow
- (c) open position
- (d) direction of the plunger slide

If choice b is selected set score to 1.

59. (2.4.4.6-1) Which of the following illustrated expansion valves is designed to maintain a constant evaporator pressure rather than a constant evaporator superheat? GS-RA-24

- (a) D
- (b) B
- (c) C
- (d) A

If choice c is selected set score to 1.

60. (2.4.4.7-5) The receiver used in a refrigeration system performs what essential function?

- (a) prevents liquid refrigerant from flooding back to the compressor
- (b) allows the refrigerant to be superheated
- (c) holds the entire refrigerant charge after system pump down
- (d) collects air and non-condensable gases

If choice c is selected set score to 1.

61. (2.4.4.7-1) Refrigeration system isolation valves are specially designed with a back-seat, as well as a front-seat. For what purpose are these valves designed in this way?

- (a) allow for operation as a suction or discharge valve
- (b) allow for removal and replacement of the valve without shutting down
- (c) permit repacking the valve stem under pressure without shutting down
- (d) allow for operation as a liquid or vapor valve

If choice c is selected set score to 1.

62. (2.4.4.7-4) In addition to the indicated gauge pressure, what other information is presented on the compound gauge for the hypothetical refrigerant illustrated? GS-RA-16

- (a) the actual temperature of the refrigerant at the point of measurement
- (b) the saturation temperature of the refrigerant that corresponds to the gauge pressure at the point of measurement
- (c) the absolute pressure of the refrigerant at the point of measurement
- (d) the metric pressure equivalent of the refrigerant at the point of measurement

If choice b is selected set score to 1.

63. (2.4.4.7-2) Which lettered component, shown in the illustration, indicates the location of the receiver? GS-RA-12

- (a) B
- (b) C
- (c) F
- (d) A

If choice b is selected set score to 1.

64. (2.4.4.7-3) In a refrigeration plant, what is one vital purpose of the receiver?

- (a) condense the refrigerant
- (b) cool the refrigerant gas
- (c) store the refrigerant charge
- (d) superheat the refrigerant liquid

If choice c is selected set score to 1.

65. (2.4.4.7-9) As shown in the illustrated LP centrifugal chiller pressure maintenance system, what is its functional purpose? GS-RA-40

- (a) prevent the entrance of air into the chiller under low heat load conditions
- (b) prevent surging
- (c) prevent the entrance of air into the chiller when the chiller is idle
- (d) maintain a relatively low compression ratio under low heat load conditions

If choice c is selected set score to 1.

66. (2.4.4.7-11) What is the purpose of the pressure transducer as shown in the illustration? GS-RA-17

- (a) it senses compressor suction pressure and controls the quench valve
- (b) it senses compressor suction pressure and controls the suction modulation valves
- (c) it senses compressor discharge pressure and controls the suction modulation valves
- (d) it senses compressor discharge pressure and controls the quench valve

If choice a is selected set score to 1.

67. (2.4.4.7-10) In addition to pressure, most compound and standard pressure gauges used for refrigeration service are also provided with a scale indicating what parameter?

- o (a) superheated refrigerant temperature
- o (b) sub cooled refrigerant temperature
- o (c) absolute pressure
- • (d) saturated refrigerant temperature

If choice d is selected set score to 1.

68. (2.4.4.7-6) Hard drawn copper tubing is commonly used in larger refrigeration systems. What statement concerning its use is true?

- o (a) Hard drawn copper tubing is easily bent, so elbow fittings are rarely used in changing direction.
- • (b) Hard drawn copper tubing is not easily flared, bent, or swaged, so brazed fittings are commonly used.
- o (c) Hard drawn copper tubing is easily flared, so flare fittings are commonly used.
- o (d) Hard drawn copper tubing is easily swaged, so reducing fittings are rarely used in changing line size.

If choice b is selected set score to 1.

69. (2.4.4.7-7) In a large refrigeration system having more than one evaporator, a king solenoid valve should be installed in what location?

- o (a) before the condenser
- • (b) just after the receiver
- o (c) before the back pressure regulating valve
- o (d) between the condenser and receiver

If choice b is selected set score to 1.

70. (2.4.4.7-8) If the valve labeled "D" in the illustration is a suction service valve, what will the port labeled "7" be connected to? GS-RA-08

- o (a) to the outlet of the compressor
- o (b) to the inlet of the compressor
- • (c) to the line connected to the evaporator outlet
- o (d) to the line connected to the evaporator inlet

If choice c is selected set score to 1.

71. (2.4.4.8-1) During the initial cooling down of a box temperature in a refrigeration system, which of the devices listed is used to prevent excessive gas pressure at the compressor suction for the purpose of prevention of overloading of the compressor driver?

- (a) Low pressure cutout
- (b) Solenoid valve
- (c) Crankcase pressure regulator
- (d) High pressure cutout

If choice c is selected set score to 1.

72. (2.4.4.8-5) The rupture disc on a low pressure centrifugal refrigeration unit is used as an over pressure protection device and is set to relieve at 15 psig and is most likely to lift when the compressor is idle? Where is the rupture disc located?

- (a) on top of the condenser shell
- (b) at the discharge of the compressor
- (c) at the top of the upper chamber of the economizer
- (d) on top of chiller evaporator shell

If choice d is selected set score to 1.

73. (2.4.4.8-2) Which of the lettered components shown in the illustration indicates the high pressure cutout? GS-RA-12

- (a) Y
- (b) Z
- (c) W
- (d) X

If choice d is selected set score to 1.

74. (2.4.4.8-4) When the relief valve opens on a refrigeration compressor discharge line, it discharges high pressure refrigerant vapor to what location?

- (a) suction side of the compressor
- (b) inlet side of the evaporator
- (c) refrigerant inlet of the condenser
- (d) liquid strainer

If choice a is selected set score to 1.

75. (2.4.4.8-3) In a refrigeration system that is not protected by a water failure switch, if the cooling water to the condenser fails, what will be the result for protective purposes?

- (a) the king valve will open
- (b) the expansion valve will close due to high superheat
- (c) the compressor will shut down by the action of the high pressure cutout switch
- (d) the box temperature solenoid valve will close initiating a pump down

If choice c is selected set score to 1.

76. (2.4.5.1-1) In a refrigeration system, what component is installed directly downstream of the thermal expansion valve?

- (a) evaporator coil
- (b) receiver
- (c) compressor
- (d) box solenoid valve

If choice a is selected set score to 1.

77. (2.4.5.1-2) Refrigeration systems using forced air circulation evaporators have a tendency to cause rapid dehydration of produce in chill boxes. Which of the following will minimize this dehydration?

- (a) the air is circulated slowly over a large evaporator with a maximum temperature differential
- (b) the air is circulated slowly over a large evaporator with a minimum temperature differential
- (c) the air is circulated rapidly over a small evaporator with a maximum temperature differential
- (d) the air is circulated rapidly over a small evaporator with a minimum temperature differential

If choice b is selected set score to 1.

78. (2.4.5.1-3) In a dry-type direct expansion refrigeration evaporator, what is true concerning the evaporator coils?

- (a) the coils are surrounded on the outside by refrigerant
- (b) the coils are surrounded on the outside by air
- (c) the coils are coated on the inside with insulation
- (d) the coils are covered on the outside with insulation

If choice b is selected set score to 1.

79. (2.4.6-1-1) Zinc plates commonly found in refrigeration systems and used as sacrificial anodes are located where?

- (a) cooling water suction strainer
- (b) refrigerant side of the condenser
- (c) evaporator coils
- (d) saltwater side of the condenser

If choice d is selected set score to 1.

80. (2.4.6.1-2) Seawater or low temperature central fresh water is typically provided to a ship's stores refrigeration plant for what purpose?

- ○ (a) prevent motor overheating
- • (b) condense the refrigerant gas
- ○ (c) prevent refrigerant superheating
- ○ (d) cool the expansion valve

If choice b is selected set score to 1.

81. (2.4.6.1-3) Heat is removed from the refrigerant circulating through the refrigeration system, shown in the illustration, by which component? GS-RA-12

- ○ (a) K
- • (b) B
- ○ (c) J
- ○ (d) A

If choice b is selected set score to 1.

82. (2.4.6.2-1) If a condenser coil of an air-cooled container refrigeration system becomes dirty and requires cleaning, what would be an acceptable method of cleaning?

- ○ (a) 'Binks' gun with weak acid solvent
- • (b) high pressure water wash
- ○ (c) copper wire rotary brush
- ○ (d) all of the above

If choice b is selected set score to 1.

83. (2.4.6.2-2) When checking zinc plates, or pencil Zincs in the refrigerating system condenser, what should you do?

- ○ (a) renew the plates at each inspection
- ○ (b) file the plates to change the negative value
- • (c) replace the Zincs if deteriorated by 50%
- ○ (d) paint and insulate the plates to prevent corrosion

If choice c is selected set score to 1.

84. (2.4.6.3-1) What is true concerning the accumulation of air and other non-condensable gases in a refrigeration system?

- ○ (a) cause a loss of the liquid seal
- ○ (b) cause foaming of the oil in the crankcase
- • (c) collect in the condenser
- ○ (d) create a vapor lock in the liquid receiver

If choice c is selected set score to 1.

85. (2.4.7.1-1) Through which of the components shown in the illustration is flash gas formation a normal occurrence? GS-RA-25

- o (a) evaporator coil
- o (b) condenser coil
- o (c) receiver tank
- • (d) thermostatic expansion valve

If choice d is selected set score to 1.

86. (2.4.7.1-2) In the multi-evaporator refrigeration system shown in the illustration, what is the proper name for the valve labeled "29"? GS-RA-12

- o (a) chill box solenoid valve
- • (b) chill box thermostatic expansion valve
- o (c) freeze box thermostatic expansion valve
- o (d) chill box evaporator pressure regulating valve

If choice b is selected set score to 1.

87. (2.4.7.1-3) Rather than design an infinite variety of thermostatic expansion valve sizes to accommodate different capacities for heat removal, some manufacturers use a few standard valve body sizes in conjunction with what other feature?

- • (a) internal needle valve orifices of various sizes to accommodate different heat removal capacities
- o (b) an externally adjustable superheat to accommodate different heat removal capacities
- o (c) internal equalizers to accommodate different heat removal capacities
- o (d) a flexible diaphragm to accommodate different heat removal capacities

If choice a is selected set score to 1.

88. (2.4.7.1-4) Constant superheat is maintained at the evaporator coil outlet of a refrigeration system or unit by the action of what device?

- • (a) thermal expansion valve
- o (b) king valve
- o (c) low pressure cutout switch
- o (d) solenoid valve

If choice a is selected set score to 1.

89. (2.4.7.1-5) Besides the evaporator pressure, the thermal expansion valve reacts directly to changes in what parameter?

- o (a) pressure drop across the evaporator coils
- o (b) liquid refrigerant pressure at the solenoid valve
- • (c) temperature of the evaporator coil outlet
- o (d) temperature of the space being cooled

If choice c is selected set score to 1.

90. (2.4.7.1-6) Which of the following illustrated expansion valves is designed to maintain a constant evaporator pressure rather than a constant evaporator superheat? GS-RA-24

- ○ (a) D
- • (b) C
- ○ (c) A
- ○ (d) B

If choice b is selected set score to 1.

91. (2.4.7.1-7) Which of the following illustrated thermal expansion valves would be appropriate to use on an evaporator coil with a 2 psi pressure drop, where externally adjustable superheat and a replaceable power element are both desired? GS-RA-06

- ○ (a) C
- • (b) B
- ○ (c) A
- ○ (d) D

If choice b is selected set score to 1.

92. (2.4.7.1-8) What is one function of the thermal expansion valve used in a refrigeration system?

- ○ (a) act as a pilot controlling the box solenoid valve
- ○ (b) turn the compressor off and on
- ○ (c) regulate the water flow to the water-cooled condenser
- • (d) regulate the amount of refrigerant flow to the evaporator coil

If choice d is selected set score to 1.

93. (2.4.7.1-9) When a refrigeration compressor is in the 'off' cycle, the thermal expansion valve will react in what way?

- • (a) it will continue to function as a result of the net balance of forces acting on the diaphragm
- ○ (b) it will always remain in the same position just prior to the cycling off of the compressor
- ○ (c) it will always completely close regardless of whether or not the system employs a pump down cycle
- ○ (d) it will always open wide regardless of whether or not the system employs a pump down cycle

If choice a is selected set score to 1.

94. (2.4.7.1-10) In a refrigeration system, the pressure within the power element of a thermostatic expansion valve depends directly upon what factor?

- ○ (a) compressor suction pressure
- ○ (b) temperature in the box
- • (c) temperature of the evaporator coil outlet
- ○ (d) heat transferred from the saturated liquid in the evaporator

If choice c is selected set score to 1.

95. (2.4.7.2-1) Of the various possible methods shown in the illustration, which is the correct method of attaching a TXV feeler bulb to a small large line (7/8" and larger) with a horizontal run? GS-RA-50

- (a) C
- (b) D
- (c) A
- (d) B

If choice a is selected set score to 1.

96. (2.4.7.2-2) A thermostatic expansion valve is properly controlling evaporator superheat. Adjusting this valve to lower the evaporator superheat setting will result in which of the following?

- (a) the evaporator pressure will decrease
- (b) the expansion valve will further close
- (c) the evaporator feed will increase
- (d) the expansion valve diaphragm will rupture

If choice c is selected set score to 1.

97. (2.4.7.2-3) When replacing a thermostatic expansion valve power element, what is true concerning the thermal bulb?

- (a) apply a heavy coating of grease to function as a heat sink
- (b) apply a light film of oil to increase heat transfer
- (c) carefully coat the device with silicone sealant to reduce the effects of convective cooling
- (d) with steel wool or an abrasive cloth remove oxidation on the bulb and suction line

If choice d is selected set score to 1.

98. (2.7.2.2-4) If the evaporator coil horizontal return line of a container refrigeration system is less than 0.875" (2.21 cm) in diameter (considered small), the thermostatic expansion valve sensing bulb should be attached where on the return line?

- (a) as close as possible to the expansion valve
- (b) directly below the point of maximum heat transfer
- (c) on the upper surface of the line
- (d) on the bottom of the line to enable the bulb to absorb the maximum amount of heat

If choice c is selected set score to 1.

99. (2.4.7.2-5) Expansion valve maintenance should include which of the following procedures?

- (a) Cleaning of in-line strainers as necessary.
- (b) Ensuring that the thermal bulb is in good contact with the suction line and insulated.
- (c) Checking that the thermal bulb is in the proper location.
- (d) All of the above.

If choice d is selected set score to 1.

100. (2.4.7.2-6) Which statement about calibrating a newly installed thermostatic expansion valve is correct?

- o (a) This procedure is done at the factory with tools not available to a mariner.
- o (b) The procedure requires a refrigeration wrench and a digital thermometer to measure box temperature.
- o (c) No special tools are required as long as the solid state circuit control panels are functioning properly.
- • (d) An accurate thermometer and suction pressure gage are essential to this process.

If choice d is selected set score to 1.

101. (2.4.7.2-7) Which of the installation steps listed is necessary for the proper operation of the thermostatic expansion valve?

- o (a) Attach the thermal bulb to the suction line using plastic ties.
- o (b) Heat shrink insulating material around the device once the bulb has been properly secured.
- • (c) Clean off oxidation from the surface of the suction line and sensing bulb with fine abrasive cloth or steel wool.
- o (d) Remove excess lengths of the sensing bulb capillary tube from the device to increase sensitivity.

If choice c is selected set score to 1.

102. (2.4.7.2-8) Which of the listed statements describes the method used to determine the amount of superheat present in the suction gas leaving the evaporator coil? GS-RA-16

- o (a) Note the low side pressure, determine the corresponding saturation temperature, and add it to the temperature measured with a thermometer at the thermostatic expansion valve sensing bulb.
- • (b) Note the low side pressure, determine the corresponding saturation temperature, and subtract it from the temperature measured with a thermometer at the thermostatic expansion valve sensing bulb.
- o (c) Note the low side pressure, determine the corresponding saturation temperature, and subtract it from the temperature measured with a thermometer at the compressor suction inlet.
- o (d) Subtract the temperature measured at the thermostatic expansion valve sensing bulb from the saturation temperature corresponding to the low side pressure.

If choice b is selected set score to 1.

103. (2.4.7.2-9) What maintenance may be carried out on a thermostatic expansion valve?

- o (a) The rate action may be increased.
- • (b) The inlet screen may be cleaned.
- o (c) The thermal bulb may be recharged.
- o (d) The proportional action may be varied.

If choice b is selected set score to 1.

104. (2.4.7.2-10) When a thermostatic expansion valve is installed in a refrigerated container unit, the sensing bulb almost always requires insulation. Why is this so?

- o (a) the insulation prevents the bulb from vibrating loose
- o (b) the insulation prevents oil entrained in the suction gas from influencing the bulb temperature
- • (c) the insulation prevents air stream temperatures from influencing the bulb temperature
- o (d) the insulation protects the clamp and screws from corrosion

If choice c is selected set score to 1.

105. (2.4.7.3-2) Which of the following conditions will occur if the power element of the thermostatic expansion valve shown in the illustration loses its charge? GS-RA-07

- o (a) The valve will fail open and the cooling capacity will be increased.
- o (b) The valve will begin to close, but the external equalizing line will assist in keeping the valve unseated.
- o (c) The valve will fail open as designed to provide continuous cooling.
- • (d) The valve will fail closed, providing no cooling capacity.

If choice d is selected set score to 1.

106. (2.4.7.3-3) If the superheat setting of a thermostatic expansion valve is set too low, what would be the result, assuming that the system has a single evaporator?

- o (a) the receiver level will be abnormally high due to a reduced amount of refrigerant returning back to the compressor
- o (b) the box temperature will be pulled way down below the normal temperature range
- • (c) the suction line will be abnormally cold and liquid may flood back to the compressor
- o (d) the suction line will be abnormally warm due to a reduced amount of refrigerant returning back to the compressor

If choice c is selected set score to 1.

107. (2.4.7.3-4) If the superheat value of the thermostatic expansion valve is adjusted too high, what would be the result?

- • (a) the suction line of the compressor will be abnormally warm
- o (b) the heat removal capacity of the evaporator will increase
- o (c) the suction line of the compressor will be abnormally cold
- o (d) the evaporator will be overfed with liquid refrigerant

If choice a is selected set score to 1.

108. (2.4.7.3-5) A small obstruction at the thermostatic expansion valve inlet will result in which of the following conditions?

- (a) Higher than normal discharge pressure.
- (b) Expansion valves are designed to pass small foreign particles so no adverse condition will occur.
- (c) Ice is the sole cause of this and will soon melt due to superheat; no adverse condition will occur.
- (d) Lower than normal suction pressure.

If choice d is selected set score to 1.

109. (2.4.7.3-6) An obstructed expansion valve may be indicated by an incompletely cooled evaporator and what other symptom?

- (a) frosting at the evaporator inlet
- (b) a higher than normal discharge pressure
- (c) a decrease in the amount of frosting across the drier
- (d) frosting at the suction side of the compressor

If choice a is selected set score to 1.

110. (2.4.7.3-7) If the needle and seat assembly is excessively eroded, the valve cage assembly can be replaced. In replacing the original valve cage assembly rated at 1/2 tons, what would be the result if the replacement valve cage was oversized at 5 tons? GS-RA-07

- (a) The evaporator would be overfed producing consistently insufficient superheat.
- (b) The expansion valve would function normally, with the presentation of no problems.
- (c) The evaporator would be starved producing consistently excessive superheat.
- (d) The expansion valve would hunt excessively, alternately starving and overfeeding the evaporator coil.

If choice d is selected set score to 1.

111. (2.4.7.3-8) Vapor bubbles present in the liquid upon arrival to the thermal expansion valve in a refrigeration system may cause erosion of the expansion valve's needle and seat. This, in turn, could cause what condition?

- (a) TXV freezing shut
- (b) TXV freezing open
- (c) TXV hunting
- (d) TXV overheating

If choice c is selected set score to 1.

112. (2.4.7.3-1) Moisture entering a typical refrigeration system will most likely produce what effect?

- ○ (a) cause sweating and frost on the evaporator coils
- ○ (b) boil in the condenser
- • (c) freeze in the expansion valve
- ○ (d) be removed by the liquid line strainers

If choice c is selected set score to 1.

113. (2.4.8.1-3) Concerning frost appearing on one set of evaporator coils of a multi-box, direct expansion type refrigeration system, what is true?

- ○ (a) the frost will increase the value of superheat to the fluid leaving the coils
- • (b) the frost can be removed by passing hot vapors through the coils
- ○ (c) the frost can be quickly removed by simply shutting off fluid flow to the coils
- ○ (d) the frost will assist in increasing the refrigeration effect

If choice b is selected set score to 1.

114. (2.4.8.1-2) What is true concerning frost build-up on the evaporator coils of a multi-box direct expansion refrigeration system?

- • (a) the frost can be removed by passing hot gas through the coils or energizing defrost heaters with the evaporator fan shut down
- ○ (b) the frost can be removed by passing hot gas through the coils or energizing defrost heaters with the evaporator fan still running
- ○ (c) the frost will increase the refrigeration effect
- ○ (d) the frost can be quickly removed by simply shutting down the compressor

If choice a is selected set score to 1.

115. (2.4.8.1-1) Some 'hot gas' defrost systems reheat the refrigerant just prior to its returning to the compressor for what purpose?

- ○ (a) to prevent chill shocking the compressor suction valves
- ○ (b) to improve the efficiency of the expansion valve
- • (c) to prevent the damaging effects of liquid slugging
- ○ (d) to increase the circulation of liquid refrigerant

If choice c is selected set score to 1.

116. (2.4.8.2-6) The FIRST thing to do to ensure that a refrigeration unit will not start while undergoing repairs is to do what?

- (a) make a log book entry
- (b) secure and tag the electrical circuit
- (c) inform all persons in the area not to start the unit
- (d) place a crow bar in the flywheel of the unit

If choice b is selected set score to 1.

117. (2.4.8.2-3) Which of the precautions listed should be taken before opening any part of a refrigeration system for the purpose of accomplishing non-major repairs?

- (a) Bring the part of the system to be opened to a pressure corresponding to the ambient temperature.
- (b) Use the hot gas defrost line to remove any frost on the evaporator coils.
- (c) Set the high pressure cutout on manual to prevent automatic starting.
- (d) Bring the part of the system to be opened to 0 psig.

If choice d is selected set score to 1.

118. (2.4.8.2-4) The pressure in the part of a high pressure refrigeration system about to be opened for a non-major repair should be brought to what value?

- (a) 11 to 12 psig
- (b) 4 to 7 psig
- (c) 1 to 2 psig
- (d) 0 psig

If choice d is selected set score to 1.

119. (2.4.8.2-5) Overfilling a refrigerant container is extremely dangerous because of the high pressures generated. The generation of pressure is the result of what?

- (a) discharge pressure from the recovery cylinder
- (b) vapor pressure of the refrigerant at saturation temperature
- (c) discharge pressure of the recovery compressor
- (d) hydrostatic pressure of the expanding liquid

If choice d is selected set score to 1.

120. (2.4.8.2-7) What is the maximum volume to which refillable refrigeration cylinders should be filled?

- (a) 80% full
- (b) 70% full
- (c) 90% full
- (d) 60% full

If choice a is selected set score to 1.

121. (2.4.8.2-2) You are checking the supply chilled water temperature thermistor probe on a high-pressure hermetic centrifugal chiller. Using the illustrated chart, what statement is true if the supply water temperature is verified 45 ° F with a digital thermometer. GS-RA-48

- (a) When checked with control power off and the thermistor probe isolated, the thermistor probe voltage drop should be 3.805 volts.
- (b) When checked with control power on and the thermistor probe isolated, the thermistor probe voltage drop should be 3.805 volts.
- (c) When checked with control power on and the thermistor probe connected into the circuit, the thermistor probe voltage drop should be 11.416 volts.
- (d) When checked with control power on and the thermistor probe connected into the circuit, the thermistor probe voltage drop should be 3.805 volts.

If choice d is selected set score to 1.

122. (2.4.8.2-8) When a refrigeration compressor has developed a high head pressure as a result of a refrigerant overcharge, what should be done to compensate for or to correct this situation?

- (a) raise the high pressure cut-out opening pressure
- (b) increase the amount of cooling water to the condenser
- (c) decrease the amount of cooling water to the condenser
- (d) remove some refrigerant from the system

If choice d is selected set score to 1.

123. (2.4.8.2-1) A box solenoid valve used in a refrigeration system should be installed in what manner?

- (a) upright, controlled by a thermostat sensing evaporator superheat, and upstream of the thermal expansion valve
- (b) upright, controlled by a thermostat sensing the temperature of the box, and upstream of the thermal expansion valve
- (c) with the axis of the solenoid horizontal, controlled by a thermostat sensing the temperature of the box, and upstream of the thermal expansion valve
- (d) upright, controlled by a thermostat sensing the temperature of the box, and downstream of the thermal expansion valve

If choice b is selected set score to 1.

124. (2.4.8.3-1) A high-pressure centrifugal chiller currently charged with R-134a is being evaluated for the need for leak testing. Using the leak-test procedures decision tree illustrated and the R-134a pressure-temperature chart illustrated, with the machine idle and the pressures equalized at 10 psig with an ambient temperature of 60 ° F, what statement is true? GS-RA-47

- (a) The machine has a suspected leak, therefore nitrogen should be added to bring the pressure to 70 psig prior to checking for leaks.
- (b) The machine has a suspected leak, therefore the refrigerant pressure should be raised to 35 psig by adding refrigerant prior to checking for leaks.
- (c) The machine definitely does not have a leak, therefore no attempt at leak detection is necessary.
- (d) The machine may or may not have a leak, therefore the machine should be checked for leaks without any adjustments in pressure.

If choice b is selected set score to 1.

125. (2.4.8.3-2) When using nitrogen to pressure leak test a system, the nitrogen cylinder should always be equipped with what device or feature?

- (a) temperature indicator
- (b) pressure regulator
- (c) blue top
- (d) level indicator

If choice b is selected set score to 1.

126. (2.4.8.3-3) Which of the following statements is correct concerning the testing of an R-22 refrigeration system for leaks in an enclosed compartment with a halide torch?

- (a) The flame of a halide torch will turn blue in the presence of R-22.
- (b) Halide torches are not suitable for detecting R-22 leaks.
- (c) Halide torches are useful in locating very small R-22 leaks.
- (d) To gain sensitivity, the largest possible flame should be used with the halide torch.

If choice c is selected set score to 1.

127. (2.4.8.4-4) If you find a refrigerant leak while using a halide torch, what will happen to the flame as the exploring tube approaches the leak?

- (a) it will change from green to blue
- (b) it will change from blue to orange
- (c) it will stay blue
- (d) it will change from blue to green

If choice d is selected set score to 1.

128. (2.4.8.4-1) In a refrigeration system, from what location would air and non-condensable gases be removed?

- (a) the top of the condenser purge connection
- (b) expansion valve equalizer connection
- (c) the bottom of the receiver drain connection
- (d) compressor oil fill connection

If choice a is selected set score to 1.

129. (2.4.8.4-2) Loss of refrigerant during the process of purging of air and non-condensable gases can be kept to a minimum by what action?

- (a) purging through a dehydrator
- (b) purging through the top of the receiver rather than the top of the condenser
- (c) cracking the purge valve briefly and allowing the refrigerant to re-settle between purges
- (d) purging through the discharge service valve rather than the top of the condenser

If choice c is selected set score to 1.

130. (2.4.8.4-3) In a low-pressure centrifugal chiller, what is meant by the term 'high efficiency purge unit?'

- (a) Those purge units which need the least amount of on-going Maintenance.
- (b) Those purge units which draw very little electrical power.
- (c) Those purge units which discharge the highest percentage of refrigerant with the air being removed.
- (d) Those purge units which discharge very little refrigerant with the air being removed.

If choice d is selected set score to 1.

131. (2.4.8.4-4) During normal operation, traditionally, how has most of the refrigerant released to the atmosphere from low pressure systems?

- (a) through water-side system leaks
- (b) through the purge unit vent
- (c) through the compressor shaft seal
- (d) through a leaking rupture disk

If choice b is selected set score to 1.

132. (2.4.8.5-1) After the refrigerant has been recovered, leaks repaired if necessary, the system ideally should undergo a dehydration evacuation prior to recharging with refrigerant. As shown in the illustration, besides the vacuum pump suction manifold isolation valve being opened, what would be the proper valve positions to accomplish and prove the evacuation? GS-RA-51

- (a) Valves 1, 2, and 3 should be back-seated and both gauge manifold hand valves should be open.
- (b) Valves 1, 2, and 3 should be front-seated and both gauge manifold hand valves should be closed.
- (c) Valves 1, 2, and 3 should be in the mid-position and the low-side gauge manifold hand valve should be open, and the high-side gauge manifold hand valve should be closed.
- (d) Valves 1, 2, and 3 should be in the mid-position and the low-side gauge manifold hand valve should be closed, and the high-side gauge manifold hand valve should be open.

If choice d is selected set score to 1.

133. (2.4.9.1-1) Concerning the operation of refrigeration systems, frosting or sweating of a liquid line is usually indicative of what condition?

- (a) high relative humidity surrounding the liquid line
- (b) a liquid line restriction
- (c) the refrigerant contaminated with moisture
- (d) proper cooling taking place

If choice b is selected set score to 1.

134. (2.4.9.2-1) An air-cooled refrigerated container unit using R-134a as a refrigerant has a box temperature set point of -15 °F, but it is currently operating with a stable return air temperature of 0 °F. The fresh air makeup vent is closed, the unit is operating at 460 VAC/60 Hz, and the unit is in full capacity cool (modulating valve 100% open). Using the illustrated troubleshooting guide, what would be the normal range of expected discharge pressures if the ambient air temperature is 90 °F? GS-RA-52

- (a) 190-230 psig
- (b) 200-220 psig
- (c) 160-180 psig
- (d) 150-190 psig

If choice d is selected set score to 1.

135. (2.4.9.2-7) If increasing the cooling water flow to a refrigeration condenser fails to lower the condenser pressure, the probable cause may be due to what condition?

- (a) a low level of Freon in the receiver
- (b) excessive amount of non-condensable gases trapped in the condenser
- (c) an evaporator coil in need of defrosting
- (d) partially blocked thermal expansion valve

If choice b is selected set score to 1.

136. (2.4.9.2-3) Which of the conditions listed could cause excessively low refrigerant pressure at the compressor suction of a TXV controlled refrigeration system?

- o (a) The high pressure cutout switch is inoperative.
- o (b) Insufficient flow of condenser cooling water.
- • (c) The system is low on refrigerant.
- o (d) The box solenoid valve 'stuck' in the open position.

If choice c is selected set score to 1.

137. (2.4.9.2-5) In an operating, water-cooled, multi-box refrigeration system, both low discharge and high suction pressures are being simultaneously experienced. The probable cause for this condition is which of the following?

- o (a) improper superheat adjustment on the low side
- o (b) fouled shell-and-tube condenser
- o (c) overcharge of refrigerant in the system
- • (d) discharge relief valve leaking back to the suction side

If choice d is selected set score to 1.

138. (2.4.9.2-2) High suction pressure accompanied by low suction temperature to a refrigeration system compressor is caused by which of the following?

- o (a) the expansion valve is insufficiently opened
- o (b) the king valve is insufficiently open
- o (c) a clogged liquid-line strainer
- • (d) the expansion valve being open too wide

If choice d is selected set score to 1.

139. (2.4.9.2-4) Low compressor head pressure in a refrigeration system can be caused by which of the following?

- • (a) excessive condenser cooling water flow
- o (b) insufficient condenser cooling water flow
- o (c) excessive refrigerant in the system
- o (d) air in the refrigeration system

If choice a is selected set score to 1.

140. (2.4.9.2-6) If the running suction pressure at the refrigeration compressor of a TXV controlled air-cooled refrigeration system is below normal, which of the following can be a cause?

- o (a) a dirty condenser
- o (b) overfeeding by the expansion valve
- • (c) a restricted liquid-line strainer
- o (d) refrigerant overcharge

If choice c is selected set score to 1.

141. (2.4.9.3-5) During tests to discover why a refrigeration compressor is running continuously, it is determined that the refrigerated space temperature is slightly above normal without ever reaching the desired minimum temperature. Suction and discharge pressures are normal for the corresponding box temperature. In this situation, what should you suspect?

- ○ (a) air in the system
- • (b) leaking door gaskets
- ○ (c) a shortage of refrigerant
- ○ (d) high cooling water temperature

If choice b is selected set score to 1.

142. (2.4.9.3-9) When a refrigeration compressor motor fails to start, the FIRST thing that should be checked for is what?

- • (a) blown fuse or tripped circuit breaker in the motor circuit
- ○ (b) faulty suction pressure regulator
- ○ (c) loose expansion valve control bulb
- ○ (d) low differential setting on the H.P. cutout

If choice a is selected set score to 1.

143. (2.4.9.3-11) If the refrigeration compressor crankcase is sweating or frosting and is operating with an unusual noise, what is most likely the cause?

- ○ (a) the compressor running continuously
- • (b) liquid refrigerant returning to the compressor
- ○ (c) a shortage of refrigerant
- ○ (d) the compressor short cycling on the high pressure cutout

If choice b is selected set score to 1.

144. (2.4.9.3-6) If a refrigeration system were short of refrigerant, besides an elevated box temperature, what would be an observable symptom?

- • (a) continuous running of the compressor
- ○ (b) short cycling of the compressor on the water failure switch
- ○ (c) high suction pressure
- ○ (d) high discharge pressure

If choice a is selected set score to 1.

145. (2.4.9.3-8) If a refrigeration compressor were short cycling on the low pressure cutout switch, what is the most probable cause?

- • (a) the expansion valve strainers were fouled
- ○ (b) the suction valves were leaking slightly
- ○ (c) the high pressure switch was improperly adjusted
- ○ (d) the system was overcharged with refrigerant

If choice a is selected set score to 1.

146. (2.4.9.3-13) If a refrigeration system, equipped with a reciprocating compressor, has a liquid-line solenoid valve that is leaking during the 'off' cycle, what would this cause?

- o (a) refrigerant slugs in the receiver
- o (b) high superheat in the outlet coil
- o (c) low suction pressure
- • (d) noisy compressor operation upon starting

If choice d is selected set score to 1.

147. (2.4.9.3-10) A refrigeration unit will tend to short cycle when operating under what conditions?

- o (a) during starting conditions
- • (b) lack of refrigerant
- o (c) during hot gas defrost
- o (d) under heavy loads

If choice b is selected set score to 1.

148. (2.4.9.3-2) If a refrigeration compressor had developed a slightly high suction pressure accompanied with an abnormally low suction temperature, the problem could be a result of which of the following?

- o (a) a clogged sub cooler
- o (b) a leaking king valve
- • (c) liquid refrigerant flooding back from the cooling coil
- o (d) a minor accumulation of air or non-condensable gases in the system

If choice c is selected set score to 1.

149. (2.4.9.3-3) An excessive charge of refrigerant in a thermostatically controlled, air-cooled, refrigeration system using a TXV as an expansion device can cause which of the following?

- o (a) the compressor to run continuously
- • (b) higher than normal discharge pressure
- o (c) lower than normal box temperature
- o (d) oil foaming in the compressor

If choice b is selected set score to 1.

150. (2.4.9.3-4) If a refrigeration compressor using a thermostat as a primary controller is running continuously without significantly lowering the temperature in the refrigerated space, which of the following is most likely the trouble?

- o (a) a shortage of compressor oil
- o (b) warm food in the refrigerator
- • (c) a shortage of refrigerant
- o (d) excessive condenser cooling water

If choice c is selected set score to 1.

151. (2.4.10.1-4) In a refrigeration system, the push-pull technique can be used for the recovery of the refrigerant in what state?

- ○ (a) vapor only
- • (b) both liquid and vapor
- ○ (c) should never be used with low pressure systems
- ○ (d) liquid only

If choice b is selected set score to 1.

152. (2.4.10.1-2) What must be done, at a minimum, before a system can legally be opened up for repairs while adhering to the prohibition against the venting of halogenated fluoro-carbon refrigerants to the atmosphere?

- ○ (a) destruction of the refrigerant
- • (b) recovery of the refrigerant
- ○ (c) reclamation of the refrigerant
- ○ (d) recycling of the refrigerant

If choice b is selected set score to 1.

153. (2.4.10.1-3) What is the correct color coding of refrigerant recovery cylinders regardless of the refrigerant contained within?

- ○ (a) light blue top and yellow lower body
- • (b) yellow top and gray body
- ○ (c) gray top and light blue lower body
- ○ (d) gray top and yellow lower body

If choice b is selected set score to 1.

154. (2.4.10.1-1) As shown in figure "B" of the illustrated self-contained recovery unit connection diagrams, what is the recovery method supported by the connection scheme? GS-RA-33

- • (a) direct vapor recovery
- ○ (b) direct liquid recovery
- ○ (c) liquid recovery/push-pull
- ○ (d) vapor recovery/push-pull

If choice a is selected set score to 1.

155. (2.4.10.2-1) Which recovery procedure should be used to minimize the loss of oil from the system during the recovery of refrigerant from small appliances such as a water cooler?

- ○ (a) liquid recovery
- ○ (b) vapor-liquid recovery
- • (c) vapor recovery
- ○ (d) initial recovery

If choice c is selected set score to 1.

156. (2.4.10.2-2) What is true concerning highly contaminated refrigerant recovered from burned out small appliances?

- (a) The recovered refrigerant may be used to clean out systems that have suffered from a burn-out.
- (b) The recovered refrigerant should be sent to a designated reclamation facility for processing.
- (c) The recovered refrigerant may be blended with new refrigerant for eventual re-use.
- (d) The recovered refrigerant must be destroyed by the refrigeration technician.

If choice b is selected set score to 1.

157. (2.4.10.2-3) Technicians servicing small refrigeration appliances can employ what type of recovery equipment?

- (a) do not need to recover the refrigerant
- (b) active only
- (c) either active or passive
- (d) passive only

If choice c is selected set score to 1.

158. (2.4.10.2-4) If passive recovery is used on a small appliance fitted with a capillary tube as a metering device with a non-operating compressor, the recovery should be made through what means?

- (a) recovery from both the high and low sides
- (b) by venting to atmosphere, cannot be recovered
- (c) recovery from the high side only
- (d) recovery from the low side only

If choice a is selected set score to 1.

159. (2.4.10.3-1) Minor repairs may be performed on low pressure refrigerant systems without recovering the refrigerant charge if the pressure in the system is raised to atmospheric. How may this be accomplished?

- (a) pressurize the system with nitrogen
- (b) heat the refrigerant
- (c) open the system vent to the atmosphere and allow the pressure to equalize
- (d) charge the system until it is completely filled with liquid refrigerant

If choice b is selected set score to 1.

160. (2.4.10.3-3) The most cost-effective method of recovering refrigerant from a low pressure chiller with more than 500 lbs of refrigerant and to meet EPA requirements is to recover the refrigerant using what protocol?

- (a) recovery using a vacuum pump based vapor recovery machine only
- (b) liquid recovery using a liquid pump, followed by vapor recovery using a vacuum pump based recovery unit
- (c) vapor recovery using a vacuum pump based recovery unit followed by liquid recovery using a liquid pump
- (d) recovering using a liquid pump only

If choice b is selected set score to 1.

161. (2.4.10.3-2) Why is a purge recovery unit typically fitted on low pressure centrifugal chillers?

- (a) evacuation of the air from a low pressure chiller prior to charging with refrigerant is not possible
- (b) low pressure chillers use extremely low boiling point refrigerants
- (c) such a chiller can operate at a pressure below atmospheric pressure on the low side thus drawing in air through any low-side leaks
- (d) low pressure chillers are routinely opened for maintenance thus introducing air at each opening

If choice c is selected set score to 1.

162. (2.4.10.4-1) As shown in the illustrated flow diagram for a self-contained recovery unit designed for the recovery of refrigerants from high pressure appliances as defined by the EPA Clean Air Act rules, what is the functional purpose of the item labeled "FS2"? GS-RA-32

- (a) It automatically shuts down the recovery unit compressor when the recovery cylinder becomes 80% full.
- (b) It automatically shuts down the recovery unit compressor when the discharge pressure becomes excessive.
- (c) It automatically shuts down the recovery unit compressor when the refrigeration system has reached a depth of 15" Hg.
- (d) It automatically transitions the recovery unit from the direct liquid recovery mode to the direct vapor recovery mode.

If choice d is selected set score to 1.

163. (2.4.11.1-2) Before charging a refrigeration unit, unless quick disconnect fittings are used, the refrigerant charging hoses should be prepared in what way?

- (a) they should be cleaned with carbon tetrachloride
- (b) they should be purged with refrigerant
- (c) they should be flushed with clean refrigerant oil
- (d) they should be warmed in an oven

If choice b is selected set score to 1.

164. (2.4.11.1-4) The amount of HCFC-123 in a storage cylinder is measured by what means?

- ○ (a) volume
- ○ (b) saturation pressure
- ○ (c) saturation temperature
- • (d) weight

If choice d is selected set score to 1.

165. (2.4.11.1-3) Concerning the charging of refrigerant into a vapor compression refrigerating system, which of the following is true?

- • (a) when charging as a liquid it should be to the high side only
- ○ (b) when charging as a liquid it should be to the low side only
- ○ (c) when charging as a vapor it should be directly to the receiver only
- ○ (d) when charging as a liquid it may be to the low or high side

If choice a is selected set score to 1.

166. (2.4.11.1-1) Which of the illustrated devices would be the LEAST accurate for the purposes of weighing-in a refrigerant charge? GS-RA-45

- ○ (a) A
- ○ (b) B
- • (c) C
- ○ (d) D

If choice c is selected set score to 1.

167. (2.4.11.2-2) How should small appliances with less than three pounds of refrigerant be charged with refrigerant?

- ○ (a) initially liquid charged and then topped with a vapor charge
- • (b) vapor charged
- ○ (c) either vapor or liquid charged
- ○ (d) liquid charged

If choice b is selected set score to 1.

168. (2.4.11.2-1) Which of the illustrated valves is used to gain access to a hermetic system and features a Schrader core valve which is unseated by the core depressor of hose fitting when attached? GS-RA-69

- • (a) D
- ○ (b) A
- ○ (c) B
- ○ (d) C

If choice a is selected set score to 1.

169. (2.4.11.3-1) Charging liquid HCFC-123 into a system under a deep vacuum could cause what to happen unless necessary precautions are taken?

- ○ (a) the purge unit to operate
- ○ (b) air and moisture to enter the receiver
- • (c) system secondary refrigerant to freeze
- ○ (d) rupture disk to rupture

If choice c is selected set score to 1.

170. (2.4.11.4-1) When a refrigeration system is being topped off with a small amount of refrigerant through the low side with the compressor running, what should be done?

- • (a) the refrigerant should be charged into the system as a vapor
- ○ (b) the refrigerant charging cylinder should be turned upside down
- ○ (c) the discharge service valve must be front seated
- ○ (d) the suction service valve must be back seated

If choice a is selected set score to 1.

171. (2.4.11.4-2) Which of the valves listed is normally closed when charging the refrigeration system through the high side?

- • (a) Liquid line king valve
- ○ (b) Dehydrator inlet valve
- ○ (c) Suction line valve
- ○ (d) Thermal expansion valve

If choice a is selected set score to 1.

172. (2.4.11.4-3) Using the device shown in the illustration, which of the following statements is true when adding refrigerant as a vapor to the low side of the refrigeration system. GS-RA-01

- ○ (a) The hose labeled "K" should be connected to the suction service valve service port, the hose labeled "J" should be connected to the vapor valve on the refrigerant cylinder and the valve labeled "C" should be closed.
- ○ (b) The hose labeled "K" should be connected to the suction service valve service port, the hose labeled "J" should be connected to the vapor valve on the refrigerant cylinder and the valve labeled "C" should be closed.
- ○ (c) The hose labeled "H" should be connected to the suction service valve service port, the hose labeled "J" should be connected to the vapor valve on the refrigerant cylinder and the valve labeled "G" should be closed.
- • (d) The hose labeled "H" should be connected to the suction service valve service port, the hose labeled "J" should be connected to the vapor valve on the refrigerant cylinder and the valve labeled "G" should be open.

If choice d is selected set score to 1.

173. (2.4.12.1-4) Coast Guard Regulations (46 CFR Part 58) require a method for the relieving pressure of an over pressurized refrigeration system. Which of the following statements complies with these Regulations?

- (a) The rupture disk shall burst at a pressure not higher than 10% above the relief valve setting.
- (b) A rupture disk may be fitted in series with the relief valve.
- (c) The relief valve settings shall be 1 1/4 times the maximum allowable working pressure.
- (d) The relief valve from the receiver must relieve to the condenser first.

If choice b is selected set score to 1.

174. (2.4.12.1-5) Coast Guard Regulations (46 CFR Part 113) require refrigerated spaces that can be locked from the outside and that cannot be opened from the inside to have an audible alarm. Where is the audible alarm required to be?

- (a) the wheelhouse
- (b) the galley
- (c) the chief steward's berthing quarters
- (d) a manned location

If choice d is selected set score to 1.

175. (2.4.12.1-2) With regards to shipboard refrigeration systems, after July 1, 1992, what action became illegal?

- (a) working on a refrigeration system without permission of the Officer in Charge Marine Inspection
- (b) mixing R-12 and R-22
- (c) intentionally venting class I or II refrigerants to the atmosphere
- (d) producing a class I refrigerant

If choice c is selected set score to 1.

176. (2.4.12.1-3) Refillable tanks used to ship CFC and HCFC refrigerants or used to recover these refrigerants must meet the standards of what entity?

- (a) the United States Coast Guard
- (b) the United States Department of Transportation
- (c) the Underwriters Laboratories
- (d) the Environmental Protection Agency

If choice b is selected set score to 1.

177. (2.4.12.1-1) According to 46 CFR, Part 58, for protection purposes, what is required of all refrigeration systems?

- (a) pressure relief device
- (b) refrigerant receiver
- (c) low pressure cut-out
- (d) high pressure cut-out

If choice a is selected set score to 1.

178. (2.4.12.2-1) What would be an example of a small appliance as defined in the EPA Clean Air Act rules?

- (a) a hermetically sealed water cooler with a 2 lb. refrigerant charge
- (b) a 200 ton low pressure centrifugal chiller for cargo hold air conditioning
- (c) a 25 ton air conditioning system set up as a split plant with the condensing unit on deck
- (d) a self-contained walk-in freezer with a 60 lbs. refrigerant charge

If choice a is selected set score to 1.

179. (2.4.12.2-9) Which best defines a "Type I" small refrigeration appliance according to the EPA Regulations Section 608?

- (a) systems manufactured and hermetically sealed having a capacity of five pounds (2.27 kg) or less of refrigerant
- (b) any appliance charged with less than ten pounds (4.54 kg) of refrigerant
- (c) refrigerators, freezers, room air conditioners and central air conditioners
- (d) any appliance charged with less than two pounds (0.91 kg) of refrigerant

If choice a is selected set score to 1.

180. (2.4.12.2-8) If you find the pressure of a refrigeration system containing a Class I or Class II refrigerant to be opened for the accomplishment of repairs is 0 psig, what must be done?

- (a) recover liquid and vapor refrigerant and have it reclaimed
- (b) only recover the liquid refrigerant in the system
- (c) do not attempt to recover the refrigerant and repair the leak before pulling a vacuum on the system
- (d) only recover the vapor refrigerant

If choice c is selected set score to 1.

181. (2.4.12.2-4) EPA Clean Air Act rules permit refrigerant to be released to the atmosphere under which of the following conditions?

- (a) when release is considered 'de minimis'
- (b) during replacement of a compressor
- (c) when adding oil to a compressor
- (d) when testing a system for leaks using R-12 and nitrogen

If choice a is selected set score to 1.

182. (2.4.12.2-3) All shipboard personnel responsible for the maintenance and repair of air conditioning systems using refrigerants covered under the EPA Clean Air Act venting prohibition, must be certified through an approved Environmental Protection Agency (EPA) program to do which of the following?

- (a) before they can pump down the system in preparation for shifting over to the standby condensing unit
- (b) before they can set the operating controls of the system
- (c) before performing Maintenance, service or repair that could reasonably be expected to release Class 1 or Class 2 refrigerants into the atmosphere
- (d) before performing any Maintenance or repair regardless of the actual procedure

If choice c is selected set score to 1.

183. (2.2.12.2-5) When recovering R-12 from a small appliance with a working compressor, using a recovery device manufactured after November 15, 1993, what percentage of the remaining charge must be removed from the system?

- (a) 75%
- (b) 99%
- (c) 90%
- (d) 80%

If choice c is selected set score to 1.

184. (2.4.12.2-6) Persons recovering refrigerant from small appliances must be certified as what type of technician under the EPA Clean Air Act rules?

- (a) Type II technician
- (b) Type III technician
- (c) Type I or Universal technician
- (d) All of the above

If choice c is selected set score to 1.

185. (2.4.12.2-7) According to the EPA Clean Air Act rules, what is true concerning refrigerant leaks in a small hermetically sealed shipboard water cooler with a 20 ounce charge weight?

- (a) The leaks must be repaired if the annual leak rate exceeds 15% of the total charge
- (b) The leaks must be repaired if the annual leak rate exceeds 35% of the total charge.
- (c) Legally, the leaks are not required to be repaired, but morally it is advisable to repair the leaks.
- (d) The leaks must be repaired within 30 days.

If choice c is selected set score to 1.

186. (2.4.12.2-2) Within the territorial limits of the United States, violations of the Clean Air Act of 1990, that includes the intentional release of R-11, R-12, R-22 and other related class I or class II substances may result in fines for each violation per day of what amount?

- (a) $50,000
- (b) $25,000
- (c) $5,000
- (d) $10,000

If choice b is selected set score to 1.

187. (2.4.13-1) For safe storage, the maximum allowable temperature to which refrigerant bottles should be exposed is what temperature?

- (a) 150°F
- (b) 125°F
- (c) 100°F
- (d) 175°F

If choice b is selected set score to 1.

188. (2.4.13-2) Overfilling a refrigerant container is extremely dangerous because of the high pressures generated. The generation of pressure is the result of what?

- (a) hydrostatic pressure of the expanding liquid
- (b) discharge pressure from the recovery cylinder
- (c) discharge pressure of the recovery compressor
- (d) vapor pressure of the refrigerant at saturation temperature

If choice a is selected set score to 1.

189. (2.4.13-3) Personnel servicing refrigeration systems and subject to the exposure to commonly used refrigerants should wear what type of personal protective equipment?

- (a) rubber soled shoes
- (b) a respirator
- (c) an all purpose gas mask
- (d) goggles and gloves

If choice d is selected set score to 1.

190. (2.4.13-4) In the presence of an open flame or hot surfaces, chlorinated fluorocarbon refrigerants decomposes and form what chemical substance?

- (a) phosgene gas
- (b) carbon monoxide
- (c) water vapor
- (d) petroleum crystals

If choice a is selected set score to 1.

191. (2.4.13-5) Why can CFC or HCFC refrigerants leaking into a confined space or in limited surroundings cause suffocation?

- (a) Refrigerants are heavier than air and displace oxygen.
- (b) Refrigerants lighter than air will rise.
- (c) Refrigerants obnoxious odor prevents breathing.
- (d) Refrigerants contain an acidic substance.

If choice a is selected set score to 1.

192. (2.4.14.1-1) Which of the following statements is true concerning the gauge labeled "A" of the illustrated gauge manifold set? GS-RA-01

- (a) The gauge labeled "A" is a compound gauge and is usually color-coded blue.
- (b) The gauge labeled "A" is a compound gauge and is usually color-coded red.
- (c) The gauge labeled "A" is a standard pressure gauge and is usually color-coded blue.
- (d) The gauge labeled "A" is a standard pressure gauge and is usually color-coded red.

If choice a is selected set score to 1.

193. (2.4.14.1-2) Which of the following statements is true concerning the illustrated gauge manifold set? GS-RA-01

- (a) The valves labeled "G" and "C" must both be open to read system pressures on the respective gages labeled "A" and "B".
- (b) Closing the valve labeled "G" isolates the hose labeled "H" from the gauge labeled "A".
- (c) Opening fully and back seating the valve labeled "G" isolates the gauge labeled "A" from the hose labeled "H".
- (d) Closing the valve labeled "G" isolates the hose labeled "H" from the hose labeled "J".

If choice d is selected set score to 1.

194. (2.4.14.2-1) When repairing a refrigeration system, a swaging tool set would be used to carry out which of the following operations?

- (a) Swaging tools can be used to expand an end of one tube to fit onto a tube of the same original outside diameter.
- (b) Swaging tools are used to remove any sweated edges formed on the tubing while soldering.
- (c) Swaging tools are used during the breaking-in of refrigeration compressors and drive motors.
- (d) Swaging tools are no longer used with repairing refrigeration systems due to progressive changes in the tool industry.

If choice a is selected set score to 1.

195. (2.4.14.3-1) Which of the illustrated gauges is capable of measuring vacuums at the micron level for the purpose of proving system dehydration during system evacuation with a vacuum pump, but displays the achieved vacuums at incremental threshold intervals rather than continuously. Illustration GS-RA-37

- (a) A
- (b) B
- (c) C
- (d) D

If choice b is selected set score to 1.

196. (2.4.15.1.1-1) What is the purpose of running a refrigeration compressor in short intermittent spurts or throttling the suction isolation valve when starting the system after a prolonged shutdown?

- (a) prevent liquid slugging or overloading the compressor
- (b) allow refrigerant vapor cycling time
- (c) let the refrigerated compartment cool gradually
- (d) determine actual compressor oil level

If choice a is selected set score to 1.

197. (2.4.15.1.1-2) When starting a reciprocating refrigeration compressor that has been shut down for a period of time, you should manually throttle which valve?

- ○ (a) king valve
- • (b) suction valve
- ○ (c) expansion valve
- ○ (d) sea water valve

If choice b is selected set score to 1.

198. (2.4.15.1.1-3) When opening or closing compressor service and line isolation valves on a typical refrigeration system that is fitted with packed valves, what must you do?

- • (a) you must first remove the stem seal cap
- ○ (b) you should replace the gasket each time the valve position is changed
- ○ (c) you should never loosen or tighten the packing gland
- ○ (d) you should turn valves slowly to avoid thermal stresses due to low temperatures

If choice a is selected set score to 1.

199. (2.4.17.1-1) In an air conditioning system, what is the name of the chamber where the duct-work originates?

- • (a) plenum chamber
- ○ (b) exhaust chamber
- ○ (c) vapor chamber
- ○ (d) intake chamber

If choice a is selected set score to 1.

200. (2.4.17.1-2) In a two stage centrifugal air conditioning system, the liquid refrigerant passes through the condenser directly to what component?

- ○ (a) expansion valve
- • (b) economizer
- ○ (c) chiller
- ○ (d) evaporator

If choice b is selected set score to 1.

201. (2.4.17.1-3) A reheater in an air conditioning system performs what function?

- • (a) restores the conditioned air temperature to a comfortable level
- ○ (b) controls the inlet air volume
- ○ (c) controls the inlet air temperature
- ○ (d) maintains the relative humidity at 15%

If choice a is selected set score to 1.

202. (2.4.17.1-4) What is one benefit of Maintenance of proper air circulation in an air conditioned cargo space?

- o (a) more temperature differential
- o (b) increased moisture content
- o (c) increased density of the air
- • (d) reduced slime and mold

If choice d is selected set score to 1.

203. (2.4.17.1-5) What is the wet bulb temperature of air if the dry bulb temperature of the air is 90 degrees and the relative humidity is 65%? Illustration GS-RA-22

- • (a) 80 degrees F
- o (b) 63 degrees F
- o (c) 77 degrees F
- o (d) 62 degrees F

If choice a is selected set score to 1.

204. (2.4.17.1-6) In general, the thermal bulb for a thermal expansion valve used in a reciprocating air conditioning system is usually charged with what substance?

- o (a) bees wax
- • (b) the same refrigerant as the system
- o (c) mercuric sulfate
- o (d) distilled water

If choice b is selected set score to 1.

205. (2.4.17.2-1) To prevent the unnecessary loading of an air conditioning system while maintaining the designed dry bulb temperature and relative humidity in an air conditioning system, what should be done?

- o (a) operate the purge recovery unit continuously
- o (b) reduce the air reheating system load
- o (c) lower the compressor head pressure
- • (d) admit only enough fresh outside air to provide proper ventilation

If choice d is selected set score to 1.

206. (2.4.17.2-2) Which of the following methods is normally used to control the circulated air temperature of an air conditioning system using chilled water circulation?

- o (a) A fan speed controller regulates the amount of air flowing across the coils.
- • (b) A regulating valve controls the quantity of chilled water flowing in the cooling coils.
- o (c) A regulating valve changes the inlet temperature of the water in the cooling coils.
- o (d) Control dampers varying the number of passes the air makes across the cooling coils.

If choice b is selected set score to 1.

207. (2.4.17.2-3) For the proper control of the air temperature in an air conditioning system using chilled water circulation, which of the listed conditions should remain constant regardless of load changes?

- o (a) Compressor discharge temperature.
- o (b) Chilled water system return temperature.
- o (c) Compressor suction pressure.
- • (d) Chilled water system supply temperature.

If choice d is selected set score to 1.

208. (2.4.17.2-4) Which of the processes listed would be the most satisfactory method to use to lower the humidity of the air being circulated by an air conditioning system?

- o (a) Cooling the air to a temperature just above dew point.
- o (b) Heating the air and then cooling it to a point below dew point.
- • (c) Cooling the air to a point below dew point, then reheating it.
- o (d) Heating the air to a point at which moisture will boil off, then recooling it.

If choice c is selected set score to 1.

209. (2.4.17.2-5) A room humidistat initiates the lowering of the humidity of the conditioned supply air to a space, while the actual process is accomplished by what means?

- o (a) raising the cooling coil temperature and lowering the reheater temperature
- o (b) raising both the cooling coil temperature and the reheater temperature
- • (c) lowering the cooling coil temperature and raising the reheater temperature
- o (d) lowering both the cooling coil temperature and the reheater temperature

If choice c is selected set score to 1.

210. (2.4.17.2-6) In an air conditioning system, moisture is removed from the air by what means?

- o (a) separators
- o (b) ducted traps
- o (c) filters
- • (d) cooling coils

If choice d is selected set score to 1.

211. (2.4.17.2-7) The introduction of outside air to the air conditioning system is 90°F with a relative humidity of 60%. The air has been conditioned to 70°F with a relative humidity of 80%. Using the psychrometric chart, shown in the illustration, determine the quantity of moisture removed from one pound of the conditioned air. See Illustration GS-RA-22

- • (a) 40 grains
- o (b) 50 grains
- o (c) 30 grains
- o (d) 20 grains

If choice a is selected set score to 1.

212. (2.4.17.2-8) If outside air at 80 degrees F and 70 percent relative humidity is conditioned, what will be the resulting dew point temperature of the air just before it comes into contact with the cooling coil? Illustration GS-RA-22

- (a) 64 degrees F
- (b) 70 degrees F
- (c) 73 degrees F
- (d) 67 degrees F

If choice b is selected set score to 1.

213. (2.4.17.2-9) Which of the following is true concerning the class "A" air conditioning system shown in the illustration as used to condition the air of large public spaces?

- (a) The reheater is not used when in the cooling mode.
- (b) The preheater steam flow is controlled by the space thermostat.
- (c) The dry bulb room temperature is controlled by a steam heated reheater and its associated pneumatic control valve. Illustration GS-RA-09
- (d) It is not possible for both the cooling coil and the steam heated reheater to be used simultaneously.

If choice c is selected set score to 1.

214. (2.4.17.2-10) Which of the following is true concerning the class "D" air conditioning system shown in the following illustration? Refer to Illustration GS-RA-42

- (a) The heat load will increase by increasing the amount of recirculated air.
- (b) The room thermostat controls the wet bulb temperature of the air conditioned space.
- (c) System cooling is the direct result of the Freon circuit of a direct type air conditioning unit.
- (d) The duct thermostat determines the amount of water flow circulating through the cooling coil.

If choice d is selected set score to 1.

215. (2.4.17.2-11) Concerning the arrangement of equipment and associated hoses shown in the illustration, what statement is true? Illustration GS-RA-59

- (a) When recovering refrigerant from the centrifugal chiller using this method, it is possible to achieve the recovery levels required by law without any further recovery.
- (b) When recovering refrigerant from the centrifugal chiller using this method, the refrigerant is being recovered as a liquid.
- (c) When recovering refrigerant from the centrifugal chiller using this method, the containment tank should be vented back to the chiller evaporator shell.
- (d) When recovering refrigerant from the centrifugal chiller using this method, the entire charge may be removed in one procedure.

If choice a is selected set score to 1.

216. (2.4.17.3-1) To add small amounts of refrigerant to the low side of an air conditioning system, the refrigerant should be introduced through a particular valve and in a particular state. What valve and state combination is correct?

- (a) suction service valve as a vapor
- (b) discharge service valve as a liquid
- (c) discharge service valve as a vapor
- (d) suction service valve as a liquid

If choice a is selected set score to 1.

217. (2.4.17.3-2) To add refrigerant to the high side of an air conditioning system, you should close the king valve and introduce the refrigerant through what valve in what state?

- (a) condenser purge valve as a vapor
- (b) suction service valve as a liquid
- (c) discharge service valve as a vapor
- (d) charging valve as a liquid

If choice d is selected set score to 1.

218. (2.4.17.3-3) When pumping down an air conditioning system to test the low pressure cutout switch, assuming that the compressor is running, what should be done to initiate the test?

- (a) secure the condenser
- (b) stop the compressor
- (c) close the 'king' valve
- (d) stop the circulating pump

If choice c is selected set score to 1.

219. (2.4.17.3-4) When recovering the remaining R-134a refrigerant from the centrifugal chiller shown in the illustration as a vapor using the recovery unit's compressor, in addition to opening valves "1a", "1b", and the compressor suction and discharge isolation valves, which of the following would be the correct valve lineup? Illustration GS-RA-28

- (a) valves "3", "5", and "6" open; valves "2", "4", "7", "8", and "10" closed
- (b) valves "3", "4", "7", "6" and "10" open; valves "2", "5", and "8" closed
- (c) valves "3", "4", and "6" open; valves "2", "5", "7", "8", and "10" closed
- (d) valves "2", "5", "7", "8", and "10" open; valves "3", "4", and "6" closed

If choice c is selected set score to 1.

220. (2.4.17.3-5) The compressor used in a water-cooled air conditioning system is short cycling. A service check determines that the suction pressure remains above the normal cut-in point during cycling and that the discharge pressure rapidly builds up to the cut-out point while running and gradually falls to the cut-in point during the off cycle. What is likely the cause?

- ○ (a) back seated discharge service valve
- • (b) reduction in condenser water flow (scaled condenser)
- ○ (c) loosely fitted compressor drive belt
- ○ (d) front seated liquid line service valve

If choice b is selected set score to 1.

221. (2.4.17.3-6) Using the illustrated chart giving the boiling point of moisture at various depths of vacuum, with an ambient temperature of 72 °F, what depth of vacuum would be associated with the BEST chance of achieving a dehydration evacuation with a deep vacuum pump? Illustration GS-RA-56

- ○ (a) 29" Hg gauge or 25,400 microns of Hg absolute
- ○ (b) 28.75" Hg gauge or 31,750 microns of Hg absolute
- ○ (c) 29.20" Hg or 20,320 microns of Hg absolute
- • (d) 29.99" Hg or 254 microns of Hg absolute

If choice d is selected set score to 1.

222. (2.4.17.3-7) Concerning the arrangement of equipment and associated hoses shown in the illustration, what statement is true?

- ○ (a) When recovering refrigerant from the centrifugal chiller using this method, it is permissible to exceed 90% of the weight capacity of the refrigerant drum.
- • (b) When recovering refrigerant from the centrifugal chiller using this method, it minimizes the risk of chiller tube freeze-up. Illustration GS-RA-58
- ○ (c) When recovering refrigerant from the centrifugal chiller using this method, it is possible to achieve the recovery levels required by law without any further recovery.
- ○ (d) When recovering refrigerant from the centrifugal chiller using this method, the vent hose connection should be closed.

If choice b is selected set score to 1.

223. (2.4.17.4-1) The surging that occurs in a centrifugal air conditioning compressor is a result of what conditions?

- • (a) low pressure in the evaporator at low load
- ○ (b) low pressure in the condenser at low load
- ○ (c) low pressure in the condenser at high load
- ○ (d) low pressure in the evaporator at high load

If choice a is selected set score to 1.

224. (2.4.17.4-2) In an air conditioning system, low discharge head pressure associated with a reciprocating compressor can be the result of what condition?

- o (a) insufficient cooling water to the condenser
- o (b) air in the evaporator coils
- • (c) leaky suction valves
- o (d) air in the condenser

If choice c is selected set score to 1.

225. (2.4.17.4-3) The air temperature associated with a direct reciprocating air conditioning plant is found to be too warm, and the compressor is not operating. A service check determines the compressor suction pressure to be above the normal cut-in point, with a normal head pressure, and high evaporator superheat. Which of the following could be the cause of this problem?

- • (a) The low pressure control contacts are stuck open.
- o (b) A liquid line solenoid valve has failed closed.
- o (c) Cooling water flow to the condenser is excessive.
- o (d) A liquid line solenoid valve is stuck open.

If choice a is selected set score to 1.

226. (2.4.17.4-4) Sludge may form in the crankcase of an air conditioning compressor as a result of what condition?

- • (a) overheating and carbonization of the oil in the crankcase
- o (b) reducing the cloud or floc point of the oil
- o (c) lowered compressor operating temperatures
- o (d) excessive foaming of the oil in the crankcase

If choice a is selected set score to 1.

227. (2.4.17.4-5) As shown in the illustrated LP centrifugal chiller high efficiency purge recovery unit piping schematic, what statement is true concerning the vacuum pump?

- • (a) The vacuum pump is designed to remove refrigerant vapor from the carbon filter tank and transfer these vapors to the evaporator to minimize the loss of refrigerant to the atmosphere.
- o (b) The vacuum pump is designed to remove refrigerant vapor from the carbon filter tank and transfer these vapors to the purge chamber to blow the float valve clear. Illustration GS-RA-55
- o (c) The vacuum pump is designed to remove air and non-condensable gases from the evaporator and transfer these gases to the carbon filter tank for eventual venting to the atmosphere.
- o (d) The vacuum pump is designed to perform a dehydration evacuation on the system prior to charging with refrigerant.

If choice a is selected set score to 1.

1. (3.5.1-1) Traditionally, which of the listed refrigerants has been more suitable than the others for use in a centrifugal refrigeration compressor?

- (a) R-11
- (b) Carbon dioxide
- (c) R-12
- (d) Ammonia

If choice a is selected set score to 1.

2. (3.5.1-2) Which of the fluids listed is suitable for use as a secondary refrigerant?

- (a) Cuprous chloride
- (b) Brine
- (c) Methyl alcohol
- (d) Carbon dioxide

If choice b is selected set score to 1.

3. (3.5.1-3) Alkylbenzene ISO 32 cSt synthetic refrigerant oil is miscible and suitable to use with which of the following refrigerants?

- (a) R-134a
- (b) R-143a
- (c) R-22
- (d) R-32

If choice c is selected set score to 1.

4. (3.5.1-4) The amount of HCFC-123 in a storage cylinder is measured by what means?

- (a) saturation pressure
- (b) saturation temperature
- (c) weight
- (d) volume

If choice c is selected set score to 1.

5. (3.5.1-5) Which of the following substances is normally classified as a low pressure refrigerant?

- (a) R-22
- (b) R-12
- (c) R-123
- (d) R-134A

If choice c is selected set score to 1

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6. (3.5.1-6) What is the color coding for a storage container of R-134a refrigerant?

- (a) green
- (b) purple
- (c) grey
- (d) light blue

If choice d is selected set score to 1.

7. (3.5.1-7) The gas that exists in the stratosphere forming a protective shield that helps to protect the environment from the harmful effects ultraviolet radiation is called what?

- (a) nitrogen
- (b) ozone
- (c) oxygen
- (d) radon

If choice b is selected set score to 1.

8. (3.5.1-8) The "tare weight" of a refrigerant storage cylinder refers to what weight?

- (a) the weight of an empty cylinder
- (b) the total weight of a fully charged cylinder
- (c) the weight of a cylinder AND its current contents
- (d) the maximum weight of the refrigerant allowed

If choice a is selected set score to 1.

9. (3.5.2.1-1) The safety heads of most large reciprocating compressors used in refrigeration systems are held in place by what means?

- (a) heavy coil springs
- (b) large Teflon gaskets
- (c) tack welding on the sides
- (d) discharge pressure in the relief valve return line

If choice a is selected set score to 1.

10. (3.5.2.1-2) In the illustrated refrigeration system, what is the proper name for the component labeled "A"? GS-RA-12

- (a) compressor
- (b) condenser
- (c) accumulator
- (d) filter drier

If choice a is selected set score to 1.

11. (3.5.2.1-3) A device used to hold open the refrigeration compressor suction valve during starting to reduce the compression load is called what?

- (a) relief valve
- (b) discharge line bypass
- (c) cylinder unloader
- (d) suction line bypass

If choice c is selected set score to 1.

12. (3.5.2.1-4) The carbon seal ring of a refrigeration compressor crankshaft mechanical seal is held in position against the stationary ring face by using what device?

- (a) snap ring
- (b) woodruff key
- (c) spring
- (d) thrust washer

If choice c is selected set score to 1.

13. (3.5.2.1-5) What is the drive arrangement of refrigeration compressor shown in figure "B" of the illustration? GS-RA-41

- (a) external-drive
- (b) welded, fully hermetic
- (c) open
- (d) serviceable, bolted, accessible semi-hermetic

If choice b is selected set score to 1.

14. (3.5.2.2-1) If the discharge reed valves used in a refrigeration compressor are leaking badly, what statement is true?

- (a) the reed valves should be reground and relapped
- (b) the low side pressure will indicate below normal
- (c) the high pressure cut-out setting should be lowered
- (d) the reed valves should be replaced

If choice d is selected set score to 1.

15. (3.5.2.2-2) In addition to the drive belt itself, a V-belt that is tensioned too tight will cause excessive wear to what other drive component?

- (a) the prime mover drive pulley
- (b) the shaft of the prime mover
- (c) the compressor drive pulley
- (d) motor shaft and compressor main bearings

If choice d is selected set score to 1.

16. (3.5.2.2-3) When one belt of a multiple V-belt drive requires replacing, what will be required?

- (a) season the new belt prior to installation
- (b) ensure the proper belt dressing is applied
- (c) replace the entire belt set
- (d) ensure the seasoned belts are reinstalled in their proper sequence

If choice c is selected set score to 1.

17. (3.5.2.2-4) Excessively tight drive belts installed between a motor and a refrigeration compressor pulley may cause what condition?

- (a) premature wear of both the pulley end motor shaft bearing and the pulley end compressor crankshaft main bearing due to overloading
- (b) premature wear of both motor shaft bearings and both compressor crankshaft main bearings due to belt slippage
- (c) premature wear of the pulley end motor shaft bearing, but normal wear of the pulley end compressor crankshaft main bearing
- (d) normal wear of the pulley end motor shaft bearing, but premature wear of the pulley end compressor crankshaft main bearing

If choice a is selected set score to 1.

18. (3.5.2.2-5) When installing a mechanical shaft seal on a refrigeration compressor, extreme care must be taken to prevent what from happening?

- (a) dirt and foreign particles from coming in contact with the highly polished sealing surfaces
- (b) any lubricant from contacting the carbon surface that would cause the expulsion of the saturated Teflon film
- (c) any lubricant from contacting the stationary seal face that would cause etching of the face surface
- (d) the spring from being damaged by the corrosive effects of excessive handling

If choice a is selected set score to 1.

19. (3.5.2.3.1-1) If a refrigeration system were short of refrigerant, besides an elevated box temperature, what would be an observable symptom?

- (a) short cycling of the compressor on the water failure switch
- (b) high suction pressure
- (c) continuous running of the compressor
- (d) high discharge pressure

If choice c is selected set score to 1.

20. (3.5.2.3.2-1) A reciprocating refrigeration compressor may be tested for leaking discharge valves by stopping the compressor, turning the discharge service valve all the way in, and then turning the compressor over by hand. If the discharge valves are leaking, the compound gage will show pressures which react in which way?

- (a) rising and falling with each stroke
- (b) decreasing to a vacuum
- (c) increasing with each stroke
- (d) decreasing with each stroke

If choice a is selected set score to 1.

21. (3.5.2.3.2-2) Which of the conditions listed could cause excessively low refrigerant pressure at the compressor suction of a TXV controlled refrigeration system?

- (a) The high pressure cutout switch is inoperative.
- (b) The system is low on refrigerant.
- (c) The box solenoid valve 'stuck' in the open position.
- (d) Insufficient flow of condenser cooling water.

If choice b is selected set score to 1.

22. (3.5.2.3.2-3) Low compressor head pressure in a refrigeration system can be caused by which of the following?

- (a) air in the refrigeration system
- (b) excessive condenser cooling water flow
- (c) excessive refrigerant in the system
- (d) insufficient condenser cooling water flow

If choice b is selected set score to 1.

23. (3.5.2.3.2-4) An excessive charge of refrigerant in a thermostatically controlled, air-cooled, refrigeration system using a TXV as an expansion device can cause which of the following?

- (a) higher than normal discharge pressure
- (b) the compressor to run continuously
- (c) lower than normal box temperature
- (d) oil foaming in the compressor

If choice a is selected set score to 1.

24. (3.5.2.3.2-5) In an operating, water-cooled, multi-box refrigeration system, both low discharge and high suction pressures are being simultaneously experienced. The probable cause for this condition is which of the following?

- (a) overcharge of refrigerant in the system
- (b) fouled shell-and-tube condenser
- (c) discharge relief valve leaking back to the suction side
- (d) improper superheat adjustment on the low side

If choice c is selected set score to 1.

25. (3.5.2.3.3-1) If a refrigeration system, equipped with a reciprocating compressor, has a liquid-line solenoid valve that is leaking during the 'off' cycle, what would this cause?

- (a) high superheat in the outlet coil
- (b) refrigerant slugs in the receiver
- (c) low suction pressure
- (d) noisy compressor operation upon starting

If choice d is selected set score to 1.

26. (3.5.2.3.3-2) Unusual noise coming from a refrigeration compressor can be caused by which of the following conditions?

- (a) worn bearings and piston pins
- (b) too much oil in circulation
- (c) slugging due to flooding back
- (d) all of the above

If choice d is selected set score to 1.

27. (3.5.2.3.4-1) Which of the listed statements describes the reason why oil foaming occurs when starting a refrigeration compressor?

- (a) This phenomenon is inherent only in hermetically sealed units and is always provisional.
- (b) This will occur only if crankcase heaters are used.
- (c) This condition is the result of the sudden low pressure created in the crankcase at start up causing the release of refrigerant absorbed within the oil.
- (d) If the oil level is not initially high, this condition is the result of agitation created by the movement of the mechanical components.

If choice c is selected set score to 1.

28. (3.5.2.3.5-1) A refrigeration unit will tend to short cycle when operating under what conditions?

- (a) under heavy loads
- (b) during starting conditions
- (c) lack of refrigerant
- (d) during hot gas defrost

If choice c is selected set score to 1.

29. (3.5.2.3.5-2) If a refrigeration compressor were short cycling on the low pressure cutout switch, what is the most probable cause?

- (a) the high pressure switch was improperly adjusted
- (b) the system was overcharged with refrigerant
- (c) the expansion valve strainers were fouled
- (d) the suction valves were leaking slightly

If choice c is selected set score to 1.

30. (3.5.3.1-1) A box solenoid valve used in a multi-box refrigeration system is operated by electro-magnetic action by what control device?

- (a) evaporator outlet temperature actuated thermostat
- (b) box temperature actuated thermostat
- (c) discharge pressure actuated pressure switch
- (d) suction pressure actuated pressure switch

If choice b is selected set score to 1.

31. (3.5.3.1-2) In a multi-evaporator refrigeration system, a solenoid valve is installed in the liquid line prior to what device?

- (a) the condenser
- (b) the receiver
- (c) the oil separator
- (d) each expansion valve

If choice d is selected set score to 1.

32. (3.5.3.1-3) A liquid line solenoid valve controls refrigerant flow to the evaporator by what means?

- (a) sensing the temperature in the liquid line
- (b) fully opening or closing
- (c) throttling the refrigerant
- (d) sensing the superheat in the tail coil

If choice b is selected set score to 1.

33. (3.5.3.1-4) How does a refrigeration solenoid valve differ from a modulating valve?

- (a) A liquid line solenoid valve is either completely opened or closed, whereas a modulation valve is infinitely positioned according to the strength of the applied electrical signal.
- (b) Both valves operate in exactly the same manner, only the manufacturer's terminology is the differentiating factor.
- (c) A solenoid valve can only be installed in liquid lines.
- (d) Solenoid Valves are only used in low voltage refrigeration control systems, while modulation valves are used in high voltage applications.

If choice a is selected set score to 1.

34. (3.5.3.1-5) Which of the following electrically operated refrigeration system valves would be most appropriate for use as a 2 position diverting hot gas bypass solenoid valve? GS-RA-19

- (a) B
- (b) D
- (c) A
- (d) C

If choice a is selected set score to 1.

35. (3.5.3.1-6) In a refrigeration system featuring low-side pump down prior to the automatic shut down of the compressor, the temperature of the refrigerated space is controlled by the action of a thermostat wired to what device?

- (a) suction line solenoid
- (b) liquid line box solenoid
- (c) low pressure cutout switch
- (d) thermostatic expansion valve

If choice b is selected set score to 1.

36. (3.5.3.1-7) The thermostat controlling the operation of the solenoid valve to a refrigerated box evaporator senses what temperature?

- (a) evaporator coil outlet temperature
- (b) compressor discharge temperature
- (c) evaporator coil inlet temperature
- (d) the refrigerated box temperature

If choice d is selected set score to 1.

37. (3.5.3.1-8) Which of the following statements is true? GS-RA-12

- (a) Valve "14" is the king solenoid, valve "36" is the chill box solenoid, and valve "28" is the freeze box solenoid.
- (b) Valve "14" is the king solenoid, valve "28" is the chill box solenoid, and valve "36" is the freeze box solenoid.
- (c) Valve "14" is the king solenoid, valves "28" and "36" are both freeze box solenoids.
- (d) Valve "14" is the king solenoid, valves "28" and "36" are both chill box solenoids.

If choice b is selected set score to 1.

38. (3.5.3.1-9) A container unit's microprocessor-controlled temperature controller is set at -28.9 ° C, appropriate for a frozen cargo of ice cream. In this mode of operation, according to the illustrated temperature controller functional diagrams, what should be the operational status of the unit if the actual box temperature is -18.0 ° C? GS-RA-035

- (a) cooling mode
- (b) modulating cooling mode
- (c) air circulation mode
- (d) heating mode

If choice a is selected set score to 1.

39. (3.5.3.1-10) What is the purpose of the low pressure cut-out switch as used as a primary controller for a refrigeration system or unit?

- (a) maintain a preset low-side pressure for the system
- (b) control the capacity of the compressor
- (c) start and stop the compressor as needed
- (d) maintain a preset suction pressure to the compressor

If choice c is selected set score to 1.

40. (3.5.3.1-11) The sensing line for the low pressure cutout switch for a refrigeration system is typically connected at what location?

- (a) at the outlet side of the receiver
- (b) at the discharge side of the compressor
- (c) at the inlet side of the receiver
- (d) at the suction side of the compressor

If choice d is selected set score to 1.

41. (3.5.3.1-12) Which of the listed operations will cause an automatically controlled refrigeration compressor to restart if the system features a pump-down cycle?

- (a) Decreasing the suction pressure
- (b) Closing of the expansion valve
- (c) An increase in the suction pressure
- (d) Closing of the solenoid valve

If choice c is selected set score to 1.

42. (3.5.3.1-13) The low pressure cutout switch settings vary with the refrigerant used and the temperature application. If the low pressure cutout switch for a particular application is set with a cut-in pressure of 5 psig, what would be the cut-out pressure if the differential is 7.5 psig?

- (a) 5" Hg
- (b) 0 psig
- (c) 2.5 psig
- (d) 12.5 psig

If choice a is selected set score to 1.

43. (3.5.3.2-1) Capacity control of a centrifugal refrigeration compressor can be accomplished by what means?

- (a) varying the speed of the compressor
- (b) varying the position of the suction inlet damper vanes
- (c) varying the position of the hot gas bypass valve
- (d) all of the above

If choice d is selected set score to 1.

44. (3.5.3.2-2) The fluid used as a source of actuating power against the underside of the unloader power element piston of the refrigeration compressor capacity control mechanism illustrated is obtained from where? GS-RA-13

- (a) gas discharge from the compressor
- (b) discharge of the compressor lube oil pump
- (c) high side liquid receiver
- (d) discharge of a secondary hydraulic pump specifically installed for this operation

If choice b is selected set score to 1.

45. (3.5.3.2-3) During operating periods of a multi-box refrigeration system using a capacity controlled compressor, when all of the evaporators of a four box plant are actively being fed with liquid refrigerant, the control oil pressure acting on the hydraulic relay piston will be at what value? GS-RA-13

- (a) the lowest
- (b) at its mid-range
- (c) the highest
- (d) of no consequence as the lube oil is not used in the operation of the unloader

If choice c is selected set score to 1.

46. (3.5.3.2-4) A refrigeration compressor used in a multi-box refrigeration system, is designed with six of its eight cylinders able to be controlled for variable load conditions. If all of the reefer boxes are currently feeding, what percentage of the total number of compressor cylinders will be loaded after start up?

- (a) 25%
- (b) 100%
- (c) 50%
- (d) 0%

If choice b is selected set score to 1.

47. (3.5.3.2-5) On a modern refrigerated container unit employing suction modulation for the purposes of capacity control and capacity limitation, what happens when the applied voltage and current draw associated with the normally open (NO) suction modulation valve located in the suction line both increase?

- (a) the valve will further open, lowering evaporator pressure and raising suction pressure
- (b) the valve will further open, raising evaporator pressure and lowering suction pressure
- (c) the valve will further close, raising evaporator pressure and lowering suction pressure
- (d) the valve will further close, lowering evaporator pressure and raising suction pressure

If choice c is selected set score to 1.

48. (3.5.3.2-6) To prevent motor overload during start-up of a hermetically sealed centrifugal refrigeration system, what is true concerning the compressor suction gas variable inlet guide vanes?

- (a) closed until the motor is connected across the line at full voltage and current drawn is below full load current
- (b) opened until the motor is connected across the line at full voltage and current drawn is up to full load current
- (c) closed until the motor is connected across the line at full voltage and current drawn is up to full load current
- (d) opened until the motor is connected across the line at full voltage and current drawn is below full load current

If choice a is selected set score to 1.

49. (3.5.3.3-1) As shown in the illustrated refrigeration system piping schematic diagram with the various accessories and controls and equipped with an air-cooled condenser with high side pressure controls, what statement is true concerning the fan cycling control pressure switch? GS-RA-39

- (a) With a condenser fitted with a single fan driven by a multi-speed electric motor, the fan speed would decrease under high ambient temperature conditions.
- (b) With a condenser fitted with a single fan driven by a multi-speed electric motor, the fan speed would decrease under low ambient temperature conditions.
- (c) With a condenser fitted with multiple electric-motor driven fans, the number of fans in use would increase under low ambient temperature conditions.
- (d) With a condenser fitted with a single fan driven by a single-speed electric motor, the fan would cycle off under high ambient temperature conditions.

If choice b is selected set score to 1.

50. (3.5.3.3-2) If it is necessary to increase the operating head pressure of the refrigeration system using the device shown in the illustration, what should be done? GS-RA-14

- (a) "2" should be turned to relax the compression of the spring
- (b) "4" should be rotated to compress the enclosed bellows
- (c) "2" should be turned to further compress the spring
- (d) "4" should be rotated to relax the enclosed bellows

If choice c is selected set score to 1.

51. (3.5.3.3-3) In a refrigeration system, the valve shown in the illustration is used for what purpose? GS-RA-14

- (a) thermostatic expansion valve
- (b) suction pressure regulating valve
- (c) evaporator pressure regulating valve
- (d) head pressure regulating valve

If choice d is selected set score to 1.

52. (3.5.3.3-4) The set point adjustment of the device shown in the illustration is made by rotating what component? GS-RA-14

- (a) "2"
- (b) "3"
- (c) "4"
- (d) "1"

If choice a is selected set score to 1.

53. (3.5.3.3-5) An arrow stamped on the valve body of a water regulating valve indicates which of the following?

- (a) closed position
- (b) direction of the plunger slide
- (c) direction of the flow
- (d) open position

If choice c is selected set score to 1.

54. (3.5.3.4-1) During the initial cooling down of a box temperature in a refrigeration system, which of the devices listed is used to prevent excessive gas pressure at the compressor suction for the purpose of prevention of overloading of the compressor driver?

- (a) High pressure cutout
- (b) Crankcase pressure regulator
- (c) Low pressure cutout
- (d) Solenoid valve

If choice b is selected set score to 1.

55. (3.5.3.4-2) The rupture disc on a low pressure centrifugal refrigeration unit is used as an over pressure protection device and is set to relieve at 15 psig and is most likely to lift when the compressor is idle? Where is the rupture disc located?

- (a) on top of the condenser shell
- (b) at the top of the upper chamber of the economizer
- (c) at the discharge of the compressor
- (d) on top of chiller evaporator shell

If choice d is selected set score to 1.

56. (3.5.3.4-3) Which of the lettered components shown in the illustration indicates the high pressure cutout? GS-RA-12

- (a) Z
- (b) W
- (c) Y
- (d) X

If choice d is selected set score to 1.

57. (3.5.3.4-4) When the relief valve opens on a refrigeration compressor discharge line, it discharges high pressure refrigerant vapor to what location?

- o (a) refrigerant inlet of the condenser
- o (b) liquid strainer
- o (c) inlet side of the evaporator
- • (d) suction side of the compressor

If choice d is selected set score to 1.

58. (3.5.3.4-5) In a refrigeration system that is not protected by a water failure switch, if the cooling water to the condenser fails, what will be the result for protective purposes?

- o (a) the king valve will open
- o (b) the box temperature solenoid valve will close initiating a pump down
- • (c) the compressor will shut down by the action of the high pressure cutout switch
- o (d) the expansion valve will close due to high superheat

If choice c is selected set score to 1.

59. (3.5.3.5-1) The receiver used in a refrigeration system performs what essential function?

- • (a) holds the entire refrigerant charge after system pump down
- o (b) collects air and non-condensable gases
- o (c) prevents liquid refrigerant from flooding back to the compressor
- o (d) allows the refrigerant to be superheated

If choice a is selected set score to 1.

60. (3.5.3.5-2) Refrigeration system isolation valves are specially designed with a back-seat, as well as a front-seat. For what purpose are these valves designed in this way?

- o (a) allow for operation as a suction or discharge valve
- o (b) allow for removal and replacement of the valve without shutting down
- • (c) permit repacking the valve stem under pressure without shutting down
- o (d) allow for operation as a liquid or vapor valve

If choice c is selected set score to 1.

61. (3.5.3.5-3) In addition to the indicated gauge pressure, what other information is presented on the compound gauge for the hypothetical refrigerant illustrated? GS-RA-16

- o (a) the absolute pressure of the refrigerant at the point of measurement
- o (b) the actual temperature of the refrigerant at the point of measurement
- o (c) the metric pressure equivalent of the refrigerant at the point of measurement
- • (d) the saturation temperature of the refrigerant that corresponds to the gauge pressure at the point of measurement

If choice d is selected set score to 1.

62. (3.5.3.5-4) Which lettered component, shown in the illustration, indicates the location of the receiver? GS-RA-12

- ○ (a) A
- • (b) C
- ○ (c) F
- ○ (d) B

If choice b is selected set score to 1.

63. (3.5.3.5-5) In a refrigeration plant, what is one vital purpose of the receiver?

- • (a) store the refrigerant charge
- ○ (b) superheat the refrigerant liquid
- ○ (c) cool the refrigerant gas
- ○ (d) condense the refrigerant

If choice a is selected set score to 1.

64. (3.5.3.5-6) As shown in the illustrated LP centrifugal chiller pressure maintenance system, what is its functional purpose? GS-RA-40

- ○ (a) prevent surging
- ○ (b) maintain a relatively low compression ratio under low heat load conditions
- ○ (c) prevent the entrance of air into the chiller under low heat load conditions
- • (d) prevent the entrance of air into the chiller when the chiller is idle

If choice d is selected set score to 1.

65. (3.5.3.5-7) What is the purpose of the pressure transducer as shown in the illustration? GS-RA-17

- • (a) it senses compressor suction pressure and controls the quench valve
- ○ (b) it senses compressor discharge pressure and controls the suction modulation valves
- ○ (c) it senses compressor suction pressure and controls the suction modulation valves
- ○ (d) it senses compressor discharge pressure and controls the quench valve

If choice a is selected set score to 1.

66. (3.5.3.5-8) In addition to pressure, most compound and standard pressure gauges used for refrigeration service are also provided with a scale indicating what parameter?

- ○ (a) absolute pressure
- ○ (b) sub cooled refrigerant temperature
- ○ (c) superheated refrigerant temperature
- • (d) saturated refrigerant temperature

If choice d is selected set score to 1.

67. (3.5.3.5-9) Hard drawn copper tubing is commonly used in larger refrigeration systems. What statement concerning its use is true?

- (a) Hard drawn copper tubing is not easily flared, bent, or swaged, so brazed fittings are commonly used.
- (b) Hard drawn copper tubing is easily swaged, so reducing fittings are rarely used in changing line size.
- (c) Hard drawn copper tubing is easily bent, so elbow fittings are rarely used in changing direction.
- (d) Hard drawn copper tubing is easily flared, so flare fittings are commonly used.

If choice a is selected set score to 1.

68. (3.5.3.5-10) In a large refrigeration system having more than one evaporator, a king solenoid valve should be installed in what location?

- (a) before the condenser
- (b) between the condenser and receiver
- (c) before the back pressure regulating valve
- (d) just after the receiver

If choice d is selected set score to 1.

69. (3.5.3.5-11) If the valve labeled "D" in the illustration is a suction service valve, what will the port labeled "7" be connected to? GS-RA-08

- (a) to the inlet of the compressor
- (b) to the line connected to the evaporator outlet
- (c) to the line connected to the evaporator inlet
- (d) to the outlet of the compressor

If choice b is selected set score to 1.

70. (3.5.4.1-1) In a refrigeration system, what component is installed directly downstream of the thermal expansion valve?

- (a) box solenoid valve
- (b) receiver
- (c) evaporator coil
- (d) compressor

If choice c is selected set score to 1.

71. (3.5.4.1-2) Refrigeration systems using forced air circulation evaporators have a tendency to cause rapid dehydration of produce in chill boxes. Which of the following will minimize this dehydration?

- (a) the air is circulated rapidly over a small evaporator with a maximum temperature differential
- (b) the air is circulated rapidly over a small evaporator with a minimum temperature differential
- (c) the air is circulated slowly over a large evaporator with a minimum temperature differential
- (d) the air is circulated slowly over a large evaporator with a maximum temperature differential

If choice c is selected set score to 1.

72. (3.5.4.1-3) In a dry-type direct expansion refrigeration evaporator, what is true concerning the evaporator coils?

- (a) the coils are covered on the outside with insulation
- (b) the coils are coated on the inside with insulation
- (c) the coils are surrounded on the outside by refrigerant
- (d) the coils are surrounded on the outside by air

If choice d is selected set score to 1.

73. (3.5.5.1-1) Zinc plates commonly found in refrigeration systems and used as sacrificial anodes are located where?

- (a) refrigerant side of the condenser
- (b) cooling water suction strainer
- (c) saltwater side of the condenser
- (d) evaporator coils

If choice c is selected set score to 1.

74. (3.5.5.1-2) Seawater or low temperature central fresh water is typically provided to a ship's stores refrigeration plant for what purpose?

- (a) prevent motor overheating
- (b) condense the refrigerant gas
- (c) cool the expansion valve
- (d) prevent refrigerant superheating

If choice b is selected set score to 1.

75. (3.5.5.1-3) Heat is removed from the refrigerant circulating through the refrigeration system, shown in the illustration, by which component? GS-RA-12

- (a) A
- (b) B
- (c) J
- (d) K

If choice b is selected set score to 1.

76. (3.5.5.2-1) If a condenser coil of an air-cooled container refrigeration system becomes dirty and requires cleaning, what would be an acceptable method of cleaning?

- (a) 'Binks' gun with weak acid solvent
- (b) high pressure water wash
- (c) copper wire rotary brush
- (d) all of the above

If choice b is selected set score to 1.

77. (3.5.5.2-2) When checking zinc plates, or pencil Zincs in the refrigerating system condenser, what should you do?

- (a) replace the Zincs if deteriorated by 50%
- (b) renew the plates at each inspection
- (c) file the plates to change the negative value
- (d) paint and insulate the plates to prevent corrosion

If choice a is selected set score to 1.

78. (3.5.5.3-1) What is true concerning the accumulation of air and other non-condensable gases in a refrigeration system?

- (a) collect in the condenser
- (b) create a vapor lock in the liquid receiver
- (c) cause a loss of the liquid seal
- (d) cause foaming of the oil in the crankcase

If choice a is selected set score to 1.

79. (3.5.6.1-1) Through which of the components shown in the illustration is flash gas formation a normal occurrence? GS-RA-25

- (a) evaporator coil
- (b) thermostatic expansion valve
- (c) receiver tank
- (d) condenser coil

If choice b is selected set score to 1.

80. (3.5.6.1-2) In the multi-evaporator refrigeration system shown in the illustration, what is the proper name for the valve labeled "29"? GS-RA-12

- (a) chill box evaporator pressure regulating valve
- (b) freeze box thermostatic expansion valve
- (c) chill box thermostatic expansion valve
- (d) chill box solenoid valve

If choice c is selected set score to 1.

81. (3.5.6.1-3) Rather than design an infinite variety of thermostatic expansion valve sizes to accommodate different capacities for heat removal, some manufacturers use a few standard valve body sizes in conjunction with what other feature?

- (a) a flexible diaphragm to accommodate different heat removal capacities
- (b) an externally adjustable superheat to accommodate different heat removal capacities
- (c) internal equalizers to accommodate different heat removal capacities
- (d) internal needle valve orifices of various sizes to accommodate different heat removal capacities

If choice d is selected set score to 1.

82. (3.5.6.1-4) Constant superheat is maintained at the evaporator coil outlet of a refrigeration system or unit by the action of what device?

- ○ (a) king valve
- ○ (b) low pressure cutout switch
- • (c) thermal expansion valve
- ○ (d) solenoid valve

If choice c is selected set score to 1.

83. (3.5.6.1-5) Besides the evaporator pressure, the thermal expansion valve reacts directly to changes in what parameter?

- • (a) temperature of the evaporator coil outlet
- ○ (b) temperature of the space being cooled
- ○ (c) liquid refrigerant pressure at the solenoid valve
- ○ (d) pressure drop across the evaporator coils

If choice a is selected set score to 1.

84. (3.5.6.1-6) Which of the following illustrated expansion valves is designed to maintain a constant evaporator pressure rather than a constant evaporator superheat? GS-RA-24

- ○ (a) A
- ○ (b) D
- • (c) C
- ○ (d) B

If choice c is selected set score to 1.

85. (3.5.6.1-7) Which of the following illustrated thermal expansion valves would be appropriate to use on an evaporator coil with a 2 psi pressure drop, where externally adjustable superheat and a replaceable power element are both desired? GS-RA-06

- ○ (a) D
- ○ (b) C
- • (c) B
- ○ (d) A

If choice c is selected set score to 1.

86. (3.5.6.1-8) What is one function of the thermal expansion valve used in a refrigeration system?

- ○ (a) turn the compressor off and on
- • (b) regulate the amount of refrigerant flow to the evaporator coil
- ○ (c) act as a pilot controlling the box solenoid valve
- ○ (d) regulate the water flow to the water-cooled condenser

If choice b is selected set score to 1.

87. (3.5.6.1-9) When a refrigeration compressor is in the 'off' cycle, the thermal expansion valve will react in what way?

- (a) it will always completely close regardless of whether or not the system employs a pump down cycle
- (b) it will always open wide regardless of whether or not the system employs a pump down cycle
- (c) it will always remain in the same position just prior to the cycling off of the compressor
- (d) it will continue to function as a result of the net balance of forces acting on the diaphragm

If choice d is selected set score to 1.

88. (3.5.6.1-10) In a refrigeration system, the pressure within the power element of a thermostatic expansion valve depends directly upon what factor?

- (a) compressor suction pressure
- (b) temperature in the box
- (c) temperature of the evaporator coil outlet
- (d) heat transferred from the saturated liquid in the evaporator

If choice c is selected set score to 1.

89. (3.5.6.1-11) In a refrigeration system, the bulb for the thermal expansion valve is always located where?

- (a) at the evaporator coil outlet
- (b) in the middle of the evaporator coils
- (c) at the evaporator coil inlet
- (d) at the beginning of the bottom row of the evaporator coils

If choice a is selected set score to 1.

90. (3.5.6.1-12) Concerning the proper installation of the sensing bulb of a thermal expansion valve that is attached to the evaporator tail coil on a horizontal run, what statement is true?

- (a) the bulb should be attached so that the pinched off tubing should be oriented down and the capillary tube running to the valve diaphragm should be oriented up
- (b) the bulb should be attached with no regard to the orientation of the pinched off tubing or the capillary tube running to the valve diaphragm
- (c) the bulb should be attached so that the pinched off tubing should be oriented up and the capillary tube running to the valve diaphragm should be oriented down
- (d) the bulb should be attached so that the pinched off tubing should be oriented to one side and the capillary tube running to the valve diaphragm should be oriented to the opposite side

If choice a is selected set score to 1.

91. (3.5.6.1-13) Which of the statements listed is applicable to the thermostatic expansion valve shown in the illustration? GS-RA-07

- (a) It regulates the temperature of the refrigerated space.
- (b) It regulates the amount of superheat at the solenoid valve.
- (c) The external equalizing pipe is connected to the liquid receiver.
- (d) The control bulb is located on the evaporator coil outlet.

If choice d is selected set score to 1.

92. (3.5.6.1-14) When the sensing bulb of a thermostatic expansion valve is charged with a fluid different from the charge used in the system, what name of the charge is associated with the power element?

- (a) cross charged
- (b) blended charged
- (c) straight charged
- (d) mixed charged

If choice a is selected set score to 1.

93. (3.5.6.1-15) A typical shipboard domestic multi-box refrigeration system operates with one compressor and condenser. What is the purpose of the sensing line connected to the thermal bulb at the evaporator coil outlet?

- (a) To direct evaporator outlet pressure to the lower part of the solenoid bellows.
- (b) To open or close the solenoid valve when the box temperature increases or decreases.
- (c) To open the back-pressure regulating valve when evaporator coil pressure increases.
- (d) To transmit the bulb pressure (proportional to the coil temperature) to the thermal expansion valve diaphragm.

If choice d is selected set score to 1.

94. (3.5.6.1-16) Refrigerant flow through a thermostatic expansion valve is greatest under what conditions?

- (a) when the low side and high side pressures are equal
- (b) when the evaporator has just begun feeding at relatively high box temperature
- (c) when the low side pressure and the bulb pressure are equal
- (d) just before the evaporator stops feeding at relatively low box temperature

If choice b is selected set score to 1.

95. (3.5.6.1-17) In a vapor compression type refrigeration cycle, the refrigerant temperature decreases the most when passing through which system component?

- ○ (a) evaporator
- ○ (b) compressor
- • (c) expansion valve
- ○ (d) condenser receiver

If choice c is selected set score to 1.

96. (3.5.6.1-18) The thermostatic expansion valve in a refrigeration system further opens when the diaphragm flexes downward. With all other conditions being the same, what single condition causes this?

- • (a) an increase in sensing bulb temperature
- ○ (b) an increase in the evaporator pressure
- ○ (c) a decrease in sensing bulb temperature
- ○ (d) increasing the superheat setting of the valve

If choice a is selected set score to 1.

97. (3.5.6.1-19) In refrigeration systems with multiple evaporators, the metering of refrigerant to each refrigerated space evaporator is accomplished by what device?

- ○ (a) the individual back pressure regulating valves
- ○ (b) the King valve
- ○ (c) the individual box Solenoid Valves
- • (d) the individual thermal expansion valves

If choice d is selected set score to 1.

98. (3.5.6.2-1) Of the various possible methods shown in the illustration, which is the correct method of attaching a TXV feeler bulb to a large line (7/8" and larger) with a horizontal run? Illustration GS-RA-50

- ○ (a) A
- ○ (b) B
- • (c) C
- ○ (d) D

If choice c is selected set score to 1.

99. (3.5.6.2-2) A thermostatic expansion valve is properly controlling evaporator superheat. Adjusting this valve to lower the evaporator superheat setting will result in which of the following?

- (a) the expansion valve will further close
- (b) the expansion valve diaphragm will rupture
- (c) the evaporator pressure will decrease
- (d) the evaporator feed will increase

If choice d is selected set score to 1.

100. (3.5.6.2-3) When replacing a thermostatic expansion valve power element, what is true concerning the thermal bulb?

- (a) apply a heavy coating of grease to function as a heat sink
- (b) with steel wool or an abrasive cloth remove oxidation on the bulb and suction line
- (c) apply a light film of oil to increase heat transfer
- (d) carefully coat the device with silicone sealant to reduce the effects of convective cooling

If choice b is selected set score to 1.

101. (3.5.6.2-4) If the evaporator coil horizontal return line of a container refrigeration system is less than 0.875" (2.21 cm) in diameter (considered small), the thermostatic expansion valve sensing bulb should be attached where on the return line?

- (a) as close as possible to the expansion valve
- (b) on the upper surface of the line
- (c) on the bottom of the line to enable the bulb to absorb the maximum amount of heat
- (d) directly below the point of maximum heat transfer

If choice b is selected set score to 1.

102. (3.5.6.2-5) Expansion valve maintenance should include which of the following procedures?

- (a) Cleaning of in-line strainers as necessary.
- (b) Ensuring that the thermal bulb is in good contact with the suction line and insulated.
- (c) Checking that the thermal bulb is in the proper location.
- (d) All of the above.

If choice d is selected set score to 1.

103. (3.5.6.2-6) Which statement about calibrating a newly installed thermostatic expansion valve is correct?

- o (a) This procedure is done at the factory with tools not available to a mariner.
- o (b) No special tools are required as long as the solid state circuit control panels are functioning properly.
- o (c) The procedure requires a refrigeration wrench and a digital thermometer to measure box temperature.
- • (d) An accurate thermometer and suction pressure gage are essential to this process.

If choice d is selected set score to 1.

104. (3.5.6.2-7) Which of the installation steps listed is necessary for the proper operation of the thermostatic expansion valve?

- o (a) Remove excess lengths of the sensing bulb capillary tube from the device to increase sensitivity.
- o (b) Attach the thermal bulb to the suction line using plastic ties.
- • (c) Clean off oxidation from the surface of the suction line and sensing bulb with fine abrasive cloth or steel wool.
- o (d) Heat shrink insulating material around the device once the bulb has been properly secured.

If choice c is selected set score to 1.

105. (3.5.6.2-8) Which of the listed statements describes the method used to determine the amount of superheat present in the suction gas leaving the evaporator coil? See Illustration GS-RA-16

- o (a) Note the low side pressure, determine the corresponding saturation temperature, and subtract it from the temperature measured with a thermometer at the compressor suction inlet.
- o (b) Subtract the temperature measured at the thermostatic expansion valve sensing bulb from the saturation temperature corresponding to the low side pressure.
- o (c) Note the low side pressure, determine the corresponding saturation temperature, and add it to the temperature measured with a thermometer at the thermostatic expansion valve sensing bulb.
- • (d) Note the low side pressure, determine the corresponding saturation temperature, and subtract it from the temperature measured with a thermometer at the thermostatic expansion valve sensing bulb.

If choice d is selected set score to 1.

106. (3.5.6.2-9) What maintenance may be carried out on a thermostatic expansion valve?

- o (a) The thermal bulb may be recharged.
- o (b) The proportional action may be varied.
- • (c) The inlet screen may be cleaned.
- o (d) The rate action may be increased.

If choice c is selected set score to 1.

107. (3.5.6.2-10) When a thermostatic expansion valve is installed in a refrigerated container unit, the sensing bulb almost always requires insulation. Why is this so?

- (a) the insulation prevents air stream temperatures from influencing the bulb temperature
- (b) the insulation protects the clamp and screws from corrosion
- (c) the insulation prevents the bulb from vibrating loose
- (d) the insulation prevents oil entrained in the suction gas from influencing the bulb temperature

If choice a is selected set score to 1.

108. (3.5.6.2-11) Which of the following statements describes the accepted method for testing a thermostatic expansion valve?

- (a) Chill the bulb in ice water while observing the compressor for an increase in suction pressure.
- (b) Remove the power head from the unit, heat the bulb with a torch while using a scale to measure the distance the diaphragm has moved.
- (c) Heat the bulb by using a halide torch or similar device and observe the valve stem movement.
- (d) Place the sensing bulb in ice water and then warm by hand. Observe flood-through and temperature change at the suction line.

If choice d is selected set score to 1.

109. (3.5.6.2-12) The coil temperature measured at the expansion valve sensing bulb of an operating system is 10°F. The low side pressure with the compressor running as shown on the gauge illustrated indicates 15 psig. What adjustments or changes, if any, should be made to the system? GS-RA-16

- (a) The evaporator coils need to be steam cleaned or high pressure washed.
- (b) The liquid line strainer is obviously fouled and needs to be cleaned.
- (c) The expansion valve should not be adjusted, as the degree of superheat is within the accepted range.
- (d) The filter drier needs to be changed to increase the suction pressure.

If choice c is selected set score to 1.

110. (3.5.6.2-13) Concerning the proper installation of the sensing bulb of a thermal expansion valve that is attached to the evaporator tail coil on a horizontal run, which statement is true?

- (a) the bulb should be attached so that the pinched off tubing should be oriented down and the capillary tube running to the valve diaphragm should be oriented up
- (b) the bulb should be attached so that the pinched off tubing should be oriented to one side and the capillary tube running to the valve diaphragm should be oriented to the opposite side
- (c) the bulb should be attached with no regard to the orientation of the pinched off tubing or the capillary tube running to the valve diaphragm
- (d) the bulb should be attached so that the pinched off tubing should be oriented up and the capillary tube running to the valve diaphragm should be oriented down

If choice a is selected set score to 1.

111. (3.5.6.3-1) Which of the following conditions will occur if the power element of the thermostatic expansion valve shown in the illustration loses its charge? GS-RA-07

- (a) The valve will begin to close, but the external equalizing line will assist in keeping the valve unseated.
- (b) The valve will fail closed, providing no cooling capacity.
- (c) The valve will fail open and the cooling capacity will be increased.
- (d) The valve will fail open as designed to provide continuous cooling.

If choice b is selected set score to 1.

112. (3.5.6.3-2) If the superheat setting of a thermostatic expansion valve is set too low, what would be the result, assuming that the system has a single evaporator?

- (a) the box temperature will be pulled way down below the normal temperature range
- (b) the receiver level will be abnormally high due to a reduced amount of refrigerant returning back to the compressor
- (c) the suction line will be abnormally warm due to a reduced amount of refrigerant returning back to the compressor
- (d) the suction line will be abnormally cold and liquid may flood back to the compressor

If choice d is selected set score to 1.

113. (3.5.6.3-3) If the superheat value of the thermostatic expansion valve is adjusted too high, what would be the result?

- (a) the heat removal capacity of the evaporator will increase
- (b) the suction line of the compressor will be abnormally warm
- (c) the evaporator will be overfed with liquid refrigerant
- (d) the suction line of the compressor will be abnormally cold

If choice b is selected set score to 1.

114. (3.5.6.3-4) A small obstruction at the thermostatic expansion valve inlet will result in which of the following conditions?

- (a) Higher than normal discharge pressure.
- (b) Expansion valves are designed to pass small foreign particles so no adverse condition will occur.
- (c) Lower than normal suction pressure.
- (d) Ice is the sole cause of this and will soon melt due to superheat; no adverse condition will occur.

If choice c is selected set score to 1.

115. (3.5.6.3-5) An obstructed expansion valve may be indicated by an incompletely cooled evaporator and what other symptom?

- (a) frosting at the evaporator inlet
- (b) frosting at the suction side of the compressor
- (c) a higher than normal discharge pressure
- (d) a decrease in the amount of frosting across the drier

If choice a is selected set score to 1.

116. (3.5.6.3-6) If the needle and seat assembly is excessively eroded, the valve cage assembly can be replaced. In replacing the original valve cage assembly rated at 1/2 tons, what would be the result if the replacement valve cage was oversized at 5 tons? GS-RA-07

- (a) The expansion valve would hunt excessively, alternately starving and overfeeding the evaporator coil.
- (b) The expansion valve would function normally, with the presentation of no problems.
- (c) The evaporator would be overfed producing consistently insufficient superheat.
- (d) The evaporator would be starved producing consistently excessive superheat.

If choice a is selected set score to 1.

117. (3.5.6.3-7) Vapor bubbles present in the liquid upon arrival to the thermal expansion valve in a refrigeration system may cause erosion of the expansion valve's needle and seat. This, in turn, could cause what condition?

- (a) TXV freezing open
- (b) TXV overheating
- (c) TXV freezing shut
- (d) TXV hunting

If choice d is selected set score to 1.

118. (3.5.6.3-8) Moisture entering a typical refrigeration system will most likely produce what effect?

- (a) boil in the condenser
- (b) freeze in the expansion valve
- (c) be removed by the liquid line strainers
- (d) cause sweating and frost on the evaporator coils

If choice b is selected set score to 1.

119. (3.5.7.1-1) Concerning the operation of refrigeration systems, frosting or sweating of a liquid line is usually indicative of what condition?

- ○ (a) proper cooling taking place
- ○ (b) high relative humidity surrounding the liquid line
- ○ (c) the refrigerant contaminated with moisture
- • (d) a liquid line restriction

If choice d is selected set score to 1.

120. (3.5.7.2-1) An air-cooled refrigerated container unit using R-134a as a refrigerant has a box temperature set point of -15 °F, but it is currently operating with a stable return air temperature of 0 °F. The fresh air makeup vent is closed, the unit is operating at 460 VAC/60 Hz, and the unit is in full capacity cool (modulating valve 100% open). Using the illustrated troubleshooting guide, what would be the normal range of expected discharge pressures if the ambient air temperature is 90 °F? Illustration GS-RA-52

- ○ (a) 190-230 psig
- ○ (b) 200-220 psig
- ○ (c) 160-180 psig
- • (d) 150-190 psig

If choice d is selected set score to 1.

121. (3.5.7.2-2) If increasing the cooling water flow to a refrigeration condenser fails to lower the condenser pressure, the probable cause may be due to what condition?

- ○ (a) partially blocked thermal expansion valve
- • (b) excessive amount of non-condensable gases trapped in the condenser
- ○ (c) an evaporator coil in need of defrosting
- ○ (d) a low level of Freon in the receiver

If choice b is selected set score to 1.

122. (3.5.7.2-3) Which of the conditions listed could cause excessively low refrigerant pressure at the compressor suction of a TXV controlled refrigeration system?

- ○ (a) The box solenoid valve 'stuck' in the open position.
- ○ (b) Insufficient flow of condenser cooling water.
- ○ (c) The high pressure cutout switch is inoperative.
- • (d) The system is low on refrigerant.

If choice d is selected set score to 1.

123. (3.5.7.2-4) In an operating, water-cooled, multi-box refrigeration system, both low discharge and high suction pressures are being simultaneously experienced. The probable cause for this condition is which of the following?

- ○ (a) fouled shell-and-tube condenser
- ○ (b) improper superheat adjustment on the low side
- • (c) discharge relief valve leaking back to the suction side
- ○ (d) overcharge of refrigerant in the system

If choice c is selected set score to 1.

124. (3.5.7.2-5) High suction pressure accompanied by low suction temperature to a refrigeration system compressor is caused by which of the following?

- ○ (a) a clogged liquid-line strainer
- ○ (b) the expansion valve is insufficiently opened
- • (c) the expansion valve being open too wide
- ○ (d) the king valve is insufficiently open

If choice c is selected set score to 1.

125. (3.5.7.2-6) Low compressor head pressure in a refrigeration system can be caused by which of the following?

- ○ (a) excessive refrigerant in the system
- ○ (b) insufficient condenser cooling water flow
- ○ (c) air in the refrigeration system
- • (d) excessive condenser cooling water flow

If choice d is selected set score to 1.

126. (3.5.7.2-7) If the running suction pressure at the refrigeration compressor of a TXV controlled air-cooled refrigeration system is below normal, which of the following can be a cause?

- ○ (a) overfeeding by the expansion valve
- ○ (b) a dirty condenser
- ○ (c) refrigerant overcharge
- • (d) a restricted liquid-line strainer

If choice d is selected set score to 1.

127. (3.3.14.3-2) While troubleshooting intermittent failures of the ship service refrigeration system you suspect the problem is with the lube oil pressure differential switch. The recommended course of action would be:

- (a) Decrease the time delay setting and see if problem persists.
- (b) Increase the switch setting and see if problem persists.
- (c) Lower the switch setting and see if problem persists.
- (d) Replace the switch as there is generally no adjustments available on the switch.

If choice d is selected set score to 1.

128. (3.3.4.1-1) The compressor on the ships service refrigeration system starts up but stops after a brief period of running. Subsequent attempts to start it produce no result. What control component would you suspect?

- (a) The water regulating valve.
- (b) The high pressure cut out.
- (c) The lube oil differential pressure switch.
- (d) The back pressure regulator.

If choice c is selected set score to 1.

129. (3.5.7.3-1) During tests to discover why a refrigeration compressor is running continuously, it is determined that the refrigerated space temperature is slightly above normal without ever reaching the desired minimum temperature. Suction and discharge pressures are normal for the corresponding box temperature. In this situation, what should you suspect?

- (a) high cooling water temperature
- (b) a shortage of refrigerant
- (c) leaking door gaskets
- (d) air in the system

If choice c is selected set score to 1.

130. (3.5.7.3-2) When a refrigeration compressor motor fails to start, the FIRST thing that should be checked for is what?

- (a) blown fuse or tripped circuit breaker in the motor circuit
- (b) loose expansion valve control bulb
- (c) faulty suction pressure regulator
- (d) low differential setting on the H.P. cutout

If choice a is selected set score to 1.

131. (3.5.7.3-3) If the refrigeration compressor crankcase is sweating or frosting and is operating with an unusual noise, what is most likely the cause?

- ○ (a) the compressor short cycling on the high pressure cutout
- ○ (b) the compressor running continuously
- ○ (c) a shortage of refrigerant
- • (d) liquid refrigerant returning to the compressor

If choice d is selected set score to 1.

132. (3.5.7.3-4) If a refrigeration system were short of refrigerant, besides an elevated box temperature, what would be an observable symptom?

- ○ (a) short cycling of the compressor on the water failure switch
- ○ (b) high suction pressure
- • (c) continuous running of the compressor
- ○ (d) high discharge pressure

If choice c is selected set score to 1.

133. (3.5.7.3-5) If a refrigeration compressor were short cycling on the low pressure cutout switch, what is the most probable cause?

- • (a) the expansion valve strainers were fouled
- ○ (b) the high pressure switch was improperly adjusted
- ○ (c) the system was overcharged with refrigerant
- ○ (d) the suction valves were leaking slightly

If choice a is selected set score to 1.

134. (3.5.7.3-6) If a refrigeration system, equipped with a reciprocating compressor, has a liquid-line solenoid valve that is leaking during the 'off' cycle, what would this cause?

- ○ (a) high superheat in the outlet coil
- ○ (b) refrigerant slugs in the receiver
- • (c) noisy compressor operation upon starting
- ○ (d) low suction pressure

If choice c is selected set score to 1.

135. (3.5.7.3-7) A refrigeration unit will tend to short cycle when operating under what conditions?

- • (a) lack of refrigerant
- ○ (b) during starting conditions
- ○ (c) under heavy loads
- ○ (d) during hot gas defrost

If choice a is selected set score to 1.

136. (3.5.7.3-8) If a refrigeration compressor had developed a slightly high suction pressure accompanied with an abnormally low suction temperature, the problem could be a result of which of the following?

- o (a) a clogged sub cooler
- • (b) liquid refrigerant flooding back from the cooling coil
- o (c) a minor accumulation of air or non-condensable gases in the system
- o (d) a leaking king valve

If choice b is selected set score to 1.

137. (3.5.7.3-9) An excessive charge of refrigerant in a thermostatically controlled, air-cooled, refrigeration system using a TXV as an expansion device can cause which of the following?

- o (a) the compressor to run continuously
- o (b) oil foaming in the compressor
- • (c) higher than normal discharge pressure
- o (d) lower than normal box temperature

If choice c is selected set score to 1.

138. (3.5.7.3-10) If a refrigeration compressor using a thermostat as a primary controller is running continuously without significantly lowering the temperature in the refrigerated space, which of the following is most likely the trouble?

- o (a) excessive condenser cooling water
- o (b) warm food in the refrigerator
- o (c) a shortage of compressor oil
- • (d) a shortage of refrigerant

If choice d is selected set score to 1.

139. (3.5.7.3-11) Moisture in a refrigeration system can cause which of the following conditions?

- o (a) freezing the expansion valve closed
- o (b) corrosion of system piping
- o (c) hermetic motor burnout
- • (d) all of the above

If choice d is selected set score to 1.

140. (3.5.7.3-12) Excessive moisture being collected in the purge unit of a low pressure refrigeration system could indicate which probable condition?

- o (a) improper charging of refrigerant
- • (b) leaking condenser or chiller tubes
- o (c) low efficiency purge unit
- o (d) dryer core needs replacement

If choice b is selected set score to 1.

141. (3.5.7.3-13) An evaporator coil of a single evaporator, air cooled refrigerator is accumulating excessive frost due to a failure of the defrost mechanism. If the refrigerator features a thermostatically controlled box solenoid and a low pressure cutout controlled compressor, as well as a high pressure cutout, in terms of the compressor, what would be the most likely operating symptom?

- (a) run continuously
- (b) fail to start
- (c) short cycle on low pressure cutout
- (d) short cycle on high pressure cutout

If choice c is selected set score to 1.

142. (3.5.7.3-14) In a low pressure refrigeration system, excessive running of the purge recovery unit generally indicates which probable condition?

- (a) overcharged system
- (b) system leaks on the low side
- (c) faulty purge system vent valve
- (d) system leaks on the high side

If choice b is selected set score to 1.

143. (3.5.8.1-1) Which recovery procedure should be used to minimize the loss of oil from the system during the recovery of refrigerant from small appliances such as a water cooler?

- (a) initial recovery
- (b) vapor recovery
- (c) liquid recovery
- (d) vapor-liquid recovery

If choice b is selected set score to 1.

144. (3.5.8.1-2) What is true concerning highly contaminated refrigerant recovered from burned out small appliances?

- (a) The recovered refrigerant may be blended with new refrigerant for eventual re-use.
- (b) The recovered refrigerant must be destroyed by the refrigeration technician.
- (c) The recovered refrigerant may be used to clean out systems that have suffered from a burn-out.
- (d) The recovered refrigerant should be sent to a designated reclamation facility for processing.

If choice d is selected set score to 1.

145. (3.5.8.1-3) Technicians servicing small refrigeration appliances can employ what type of recovery equipment?

- (a) do not need to recover the refrigerant
- (b) either active or passive
- (c) passive only
- (d) active only

If choice b is selected set score to 1.

146. (3.5.8.1-4) If passive recovery is used on a small appliance fitted with a capillary tube as a metering device with a non-operating compressor, the recovery should be made through what means?

- (a) by venting to atmosphere, cannot be recovered
- (b) recovery from both the high and low sides
- (c) recovery from the high side only
- (d) recovery from the low side only

If choice b is selected set score to 1.

147. (3.5.8.2-1) Minor repairs may be performed on low pressure refrigerant systems without recovering the refrigerant charge if the pressure in the system is raised to atmospheric. How may this be accomplished?

- (a) pressurize the system with nitrogen
- (b) open the system vent to the atmosphere and allow the pressure to equalize
- (c) charge the system until it is completely filled with liquid refrigerant
- (d) heat the refrigerant

If choice d is selected set score to 1.

148. (3.5.8.2-2) The most cost-effective method of recovering refrigerant from a low pressure chiller with more than 500 lbs of refrigerant and to meet EPA requirements is to recover the refrigerant using what protocol?

- (a) recovery using a vacuum pump based vapor recovery machine only
- (b) vapor recovery using a vacuum pump based recovery unit followed by liquid recovery using a liquid pump
- (c) recovering using a liquid pump only
- (d) liquid recovery using a liquid pump, followed by vapor recovery using a vacuum pump based recovery unit

If choice d is selected set score to 1.

149. (3.5.8.2-3) Why is a purge recovery unit typically fitted on low pressure centrifugal chillers?

- (a) low pressure chillers are routinely opened for maintenance thus introducing air at each opening
- (b) such a chiller can operate at a pressure below atmospheric pressure on the low side thus drawing in air through any low-side leaks
- (c) low pressure chillers use extremely low boiling point refrigerants
- (d) evacuation of the air from a low pressure chiller prior to charging with refrigerant is not possible

If choice b is selected set score to 1.

150. (3.5.8.3-1) As shown in the illustrated flow diagram for a self-contained recovery unit designed for the recovery of refrigerants from high pressure appliances as defined by the EPA Clean Air Act rules, what is the functional purpose of the item labeled "FS2"? GS-RA-32

- (a) It automatically shuts down the recovery unit compressor when the recovery cylinder becomes 80% full.
- (b) It automatically shuts down the recovery unit compressor when the discharge pressure becomes excessive.
- (c) It automatically shuts down the recovery unit compressor when the refrigeration system has reached a depth of 15" Hg.
- (d) It automatically transitions the recovery unit from the direct liquid recovery mode to the direct vapor recovery mode.

If choice d is selected set score to 1.

151. (3.5.9.1-1) How should small appliances with less than three pounds of refrigerant be charged with refrigerant?

- (a) liquid charged
- (b) initially liquid charged and then topped with a vapor charge
- (c) vapor charged
- (d) either vapor or liquid charged

If choice c is selected set score to 1.

152. (3.5.9.2-1) Charging liquid HCFC-123 into a system under a deep vacuum could cause what to happen unless necessary precautions are taken?

- (a) rupture disk to rupture
- (b) air and moisture to enter the receiver
- (c) system secondary refrigerant to freeze
- (d) the purge unit to operate

If choice c is selected set score to 1.

153. (3.5.9.3-1) When a refrigeration system is being topped off with a small amount of refrigerant through the low side with the compressor running, what should be done?

- ○ (a) the discharge service valve must be front seated
- ○ (b) the refrigerant charging cylinder should be turned upside down
- • (c) the refrigerant should be charged into the system as a vapor
- ○ (d) the suction service valve must be back seated

If choice c is selected set score to 1.

154. (3.5.9.3-2) Which of the valves listed is normally closed when charging the refrigeration system through the high side?

- ○ (a) Dehydrator inlet valve
- ○ (b) Thermal expansion valve
- • (c) Liquid line king valve
- ○ (d) Suction line valve

If choice c is selected set score to 1.

155. (3.5.9.3-3) Using the device shown in the illustration, which of the following statements is true when adding refrigerant as a vapor to the low side of the refrigeration system. GS-RA-01

- • (a) The hose labeled "H" should be connected to the suction service valve service port, the hose labeled "J" should be connected to the vapor valve on the refrigerant cylinder and the valve labeled "G" should be open.
- ○ (b) The hose labeled "H" should be connected to the suction service valve service port, the hose labeled "J" should be connected to the vapor valve on the refrigerant cylinder and the valve labeled "G" should be closed.
- ○ (c) The hose labeled "K" should be connected to the suction service valve service port, the hose labeled "J" should be connected to the vapor valve on the refrigerant cylinder and the valve labeled "C" should be closed.
- ○ (d) The hose labeled "K" should be connected to the suction service valve service port, the hose labeled "J" should be connected to the vapor valve on the refrigerant cylinder and the valve labeled "C" should be closed.

If choice a is selected set score to 1.

156. (3.5.10-1) For safe storage, the maximum allowable temperature to which refrigerant bottles should be exposed is what temperature?

- ○ (a) 150°F
- • (b) 125°F
- ○ (c) 175°F
- ○ (d) 100°F

If choice b is selected set score to 1.

157. (3.5.10-2) Overfilling a refrigerant container is extremely dangerous because of the high pressures generated. The generation of pressure is the result of what?

- (a) discharge pressure from the recovery cylinder
- (b) vapor pressure of the refrigerant at saturation temperature
- (c) hydrostatic pressure of the expanding liquid
- (d) discharge pressure of the recovery compressor

If choice c is selected set score to 1.

158. (3.5.10-3) Personnel servicing refrigeration systems and subject to the exposure to commonly used refrigerants should wear what type of personal protective equipment?

- (a) an all purpose gas mask
- (b) rubber soled shoes
- (c) goggles and gloves
- (d) a respirator

If choice c is selected set score to 1.

159. (3.5.10-4) In the presence of an open flame or hot surfaces, chlorinated fluorocarbon refrigerants decomposes and form what chemical substance?

- (a) petroleum crystals
- (b) water vapor
- (c) carbon monoxide
- (d) phosgene gas

If choice d is selected set score to 1.

160. (3.5.10-5) Why can CFC or HCFC refrigerants leaking into a confined space or in limited surroundings cause suffocation?

- (a) Refrigerants are heavier than air and displace oxygen.
- (b) Refrigerants contain an acidic substance.
- (c) Refrigerants obnoxious odor prevents breathing.
- (d) Refrigerants lighter than air will rise.

If choice a is selected set score to 1.

161. (3.5.12.1.1-1) What is the purpose of running a refrigeration compressor in short intermittent spurts or throttling the suction isolation valve when starting the system after a prolonged shutdown?

- (a) let the refrigerated compartment cool gradually
- (b) prevent liquid slugging or overloading the compressor
- (c) allow refrigerant vapor cycling time
- (d) determine actual compressor oil level

If choice b is selected set score to 1.

162. (3.5.12.1.1-2) When starting a reciprocating refrigeration compressor that has been shut down for a period of time, you should manually throttle which valve?

- (a) suction valve
- (b) sea water valve
- (c) king valve
- (d) expansion valve

If choice a is selected set score to 1.

163. (3.5.12.1.1-3) When opening or closing compressor service and line isolation valves on a typical refrigeration system that is fitted with packed valves, what must you do?

- (a) you should replace the gasket each time the valve position is changed
- (b) you should never loosen or tighten the packing gland
- (c) you must first remove the stem seal cap
- (d) you should turn valves slowly to avoid thermal stresses due to low temperatures

If choice c is selected set score to 1.

164. (3.5.13.1-1) In an air conditioning system, what is the name of the chamber where the duct-work originates?

- (a) plenum chamber
- (b) vapor chamber
- (c) exhaust chamber
- (d) intake chamber

If choice a is selected set score to 1.

165. (3.5.13.1-2) In a two stage centrifugal air conditioning system, the liquid refrigerant passes through the condenser directly to what component?

- (a) chiller
- (b) evaporator
- (c) economizer
- (d) expansion valve

If choice c is selected set score to 1.

166. (3.5.13.1-3) A reheater in an air conditioning system performs what function?

- (a) restores the conditioned air temperature to a comfortable level
- (b) controls the inlet air volume
- (c) maintains the relative humidity at 15%
- (d) controls the inlet air temperature

If choice a is selected set score to 1.

167. (3.5.13.1-4) What is one benefit of Maintenance of proper air circulation in an air conditioned cargo space?

- ○ (a) more temperature differential
- • (b) reduced slime and mold
- ○ (c) increased moisture content
- ○ (d) increased density of the air

If choice b is selected set score to 1.

168. (3.5.13.1-5) What is the wet bulb temperature of air if the dry bulb temperature of the air is 90 degrees and the relative humidity is 65%? Illustration GS-RA-22

- ○ (a) 62 degrees F
- ○ (b) 63 degrees F
- • (c) 80 degrees F
- ○ (d) 77 degrees F

If choice c is selected set score to 1.

169. (3.5.13.1-6) In general, the thermal bulb for a thermal expansion valve used in a reciprocating air conditioning system is usually charged with what substance?

- ○ (a) mercuric sulfate
- ○ (b) bees wax
- ○ (c) distilled water
- • (d) the same refrigerant as the system

If choice d is selected set score to 1.

170. (3.5.13.2-1) To prevent the unnecessary loading of an air conditioning system while maintaining the designed dry bulb temperature and relative humidity in an air conditioning system, what should be done?

- ○ (a) reduce the air reheating system load
- ○ (b) lower the compressor head pressure
- ○ (c) operate the purge recovery unit continuously
- • (d) admit only enough fresh outside air to provide proper ventilation

If choice d is selected set score to 1.

171. (3.5.13.2-2) Which of the following methods is normally used to control the circulated air temperature of an air conditioning system using chilled water circulation?

- ○ (a) A regulating valve changes the inlet temperature of the water in the cooling coils.
- ○ (b) A fan speed controller regulates the amount of air flowing across the coils.
- • (c) A regulating valve controls the quantity of chilled water flowing in the cooling coils.
- ○ (d) Control dampers varying the number of passes the air makes across the cooling coils.

If choice c is selected set score to 1.

172. (3.5.13.2-3) For the proper control of the air temperature in an air conditioning system using chilled water circulation, which of the listed conditions should remain constant regardless of load changes?

- (a) Chilled water system supply temperature.
- (b) Chilled water system return temperature.
- (c) Compressor discharge temperature.
- (d) Compressor suction pressure.

If choice a is selected set score to 1.

173. (3.5.13.2-4) Which of the processes listed would be the most satisfactory method to use to lower the humidity of the air being circulated by an air conditioning system?

- (a) Heating the air and then cooling it to a point below dew point.
- (b) Cooling the air to a point below dew point, then reheating it.
- (c) Cooling the air to a temperature just above dew point.
- (d) Heating the air to a point at which moisture will boil off, then recooling it.

If choice b is selected set score to 1.

174. (3.5.13.2-5) A room humidistat initiates the lowering of the humidity of the conditioned supply air to a space, while the actual process is accomplished by what means?

- (a) lowering the cooling coil temperature and raising the reheater temperature
- (b) raising both the cooling coil temperature and the reheater temperature
- (c) lowering both the cooling coil temperature and the reheater temperature
- (d) raising the cooling coil temperature and lowering the reheater temperature

If choice a is selected set score to 1.

175. (3.5.13.2-6) In an air conditioning system, moisture is removed from the air by what means?

- (a) separators
- (b) cooling coils
- (c) ducted traps
- (d) filters

If choice b is selected set score to 1.

176. (3.5.13.2-7) The introduction of outside air to the air conditioning system is 90°F with a relative humidity of 60%. The air has been conditioned to 70°F with a relative humidity of 80%. Using the psychrometric chart, shown in the illustration, determine the quantity of moisture removed from one pound of the conditioned air. Illustration GS-RA-22

- (a) 50 grains
- (b) 20 grains
- (c) 40 grains
- (d) 30 grains

If choice c is selected set score to 1.

177. (3.5.13.2-8) If outside air at 80 degrees F and 70 percent relative humidity is conditioned, what will be the resulting dew point temperature of the air just before it comes into contact with the cooling coil? Illustration GS-RA-22

- (a) 67 degrees F
- (b) 73 degrees F
- (c) 64 degrees F
- (d) 70 degrees F

If choice d is selected set score to 1.

178. (3.5.13.2-9) Which of the following is true concerning the class "A" air conditioning system shown in the illustration as used to condition the air of large public spaces?

- (a) The preheater steam flow is controlled by the space thermostat.
- (b) It is not possible for both the cooling coil and the steam heated reheater to be used simultaneously.
- (c) The dry bulb room temperature is controlled by a steam heated reheater and its associated pneumatic control valve. Illustration GS-RA-09
- (d) The reheater is not used when in the cooling mode.

If choice c is selected set score to 1.

179. (3.5.13.2-10) Which of the following is true concerning the class "D" air conditioning system shown in the following illustration? Illustration GS-RA-42

- (a) The duct thermostat determines the amount of water flow circulating through the cooling coil.
- (b) System cooling is the direct result of the Freon circuit of a direct type air conditioning unit.
- (c) The heat load will increase by increasing the amount of recirculated air.
- (d) The room thermostat controls the wet bulb temperature of the air conditioned space.

If choice a is selected set score to 1.

180. (3.5.13.2-11) Concerning the arrangement of equipment and associated hoses shown in the illustration, which statement is true? Illustration GS-RA-59

- (a) When recovering refrigerant from the centrifugal chiller using this method, the entire charge may be removed in one procedure.
- (b) When recovering refrigerant from the centrifugal chiller using this method, it is possible to achieve the recovery levels required by law without any further recovery.
- (c) When recovering refrigerant from the centrifugal chiller using this method, the containment tank should be vented back to the chiller evaporator shell.
- (d) When recovering refrigerant from the centrifugal chiller using this method, the refrigerant is being recovered as a liquid.

If choice b is selected set score to 1.

181. (3.5.13.3-1) To add small amounts of refrigerant to the low side of an air conditioning system, the refrigerant should be introduced through a particular valve and in a particular state. What valve and state combination is correct?

- (a) discharge service valve as a vapor
- (b) suction service valve as a vapor
- (c) discharge service valve as a liquid
- (d) suction service valve as a liquid

If choice b is selected set score to 1.

182. (3.5.13.3-2) To add refrigerant to the high side of an air conditioning system, you should close the king valve and introduce the refrigerant through what valve in what state?

- (a) discharge service valve as a vapor
- (b) charging valve as a liquid
- (c) suction service valve as a liquid
- (d) condenser purge valve as a vapor

If choice b is selected set score to 1.

183. (3.5.13.3-3) When pumping down an air conditioning system to test the low pressure cutout switch, assuming that the compressor is running, what should be done to initiate the test?

- (a) stop the compressor
- (b) secure the condenser
- (c) close the "king" valve
- (d) stop the circulating pump

If choice c is selected set score to 1.

184. (3.5.13.3-4) When recovering the remaining R-134a refrigerant from the centrifugal chiller shown in the illustration as a vapor using the recovery unit's compressor, in addition to opening valves "1a", "1b", and the compressor suction and discharge isolation valves, which of the following would be the correct valve lineup? See Illustration GS-RA-28

- (a) valves "3", "4", and "6" open; valves "2", "5", "7", "8", and "10" closed
- (b) valves "2", "5", "7", "8", and "10" open; valves "3", "4", and "6" closed
- (c) valves "3", "5", and "6" open; valves "2", "4", "7", "8", and "10" closed
- (d) valves "3", "4", "7", "6" and "10" open; valves "2", "5", and "8" closed

If choice a is selected set score to 1.

185. (3.5.13.3-5) The compressor used in a water-cooled air conditioning system is short cycling. A service check determines that the suction pressure remains above the normal cut-in point during cycling and that the discharge pressure rapidly builds up to the cut-out point while running and gradually falls to the cut-in point during the off cycle. What is likely the cause?

- (a) front seated liquid line service valve
- (b) back seated discharge service valve
- (c) loosely fitted compressor drive belt
- (d) reduction in condenser water flow (scaled condenser)

If choice d is selected set score to 1.

186. (3.5.13.3-6) Using the illustrated chart giving the boiling point of moisture at various depths of vacuum, with an ambient temperature of 72 °F, what depth of vacuum would be associated with the BEST chance of achieving a dehydration evacuation with a deep vacuum pump? Illustration GS-RA-56

- (a) 29.20" Hg or 20,320 microns of Hg absolute
- (b) 28.75" Hg gauge or 31,750 microns of Hg absolute
- (c) 29" Hg gauge or 25,400 microns of Hg absolute
- (d) 29.99" Hg or 254 microns of Hg absolute

If choice d is selected set score to 1.

187. (3.5.13.3-7) Concerning the arrangement of equipment and associated hoses shown in the illustration, which statement is true? Illustration GS-RA-58

- (a) When recovering refrigerant from the centrifugal chiller using this method, it is possible to achieve the recovery levels required by law without any further recovery.
- (b) When recovering refrigerant from the centrifugal chiller using this method, it minimizes the risk of chiller tube freeze-up.
- (c) When recovering refrigerant from the centrifugal chiller using this method, the vent hose connection should be closed.
- (d) When recovering refrigerant from the centrifugal chiller using this method, it is permissible to exceed 90% of the weight capacity of the refrigerant drum.

If choice b is selected set score to 1.

188. (3.5.13.4-1) The surging that occurs in a centrifugal air conditioning compressor is a result of what conditions?

- (a) low pressure in the evaporator at high load
- (b) low pressure in the evaporator at low load
- (c) low pressure in the condenser at high load
- (d) low pressure in the condenser at low load

If choice b is selected set score to 1.

189. (3.5.13.4-2) In an air conditioning system, low discharge head pressure associated with a reciprocating compressor can be the result of what condition?

- (a) leaky suction valves
- (b) insufficient cooling water to the condenser
- (c) air in the condenser
- (d) air in the evaporator coils

If choice a is selected set score to 1.

190. (3.5.13.1-1) Coast Guard Regulations (46 CFR Part 58) require a method for the relieving pressure of an over pressurized refrigeration system. Which of the following statements complies with these Regulations?

- (a) The relief valve from the receiver must relieve to the condenser first.
- (b) The relief valve settings shall be 1 1/4 times the maximum allowable working pressure.
- (c) A rupture disk may be fitted in series with the relief valve.
- (d) The rupture disk shall burst at a pressure not higher than 10% above the relief valve setting.

If choice c is selected set score to 1.

191. (3.5.13.1-2) Coast Guard Regulations (46 CFR Part 113) require refrigerated spaces that can be locked from the outside and that cannot be opened from the inside to have an audible alarm. Where is the audible alarm required to be?

- (a) the galley
- (b) a manned location
- (c) the wheelhouse
- (d) the chief steward's berthing quarters

If choice b is selected set score to 1.

192. (3.5.13.1-3) With regards to shipboard refrigeration systems, after July 1, 1992, what action became illegal?

- (a) working on a refrigeration system without permission of the Officer in Charge Marine Inspection
- (b) producing a class I refrigerant
- (c) intentionally venting class I or II refrigerants to the atmosphere
- (d) mixing R-12 and R-22

If choice c is selected set score to 1.

193. (3.5.13.1-4) Refillable tanks used to ship CFC and HCFC refrigerants or used to recover these refrigerants must meet the standards of what entity?

- (a) the United States Department of Transportation
- (b) the Environmental Protection Agency
- (c) the United States Coast Guard
- (d) the Underwriters Laboratories

If choice a is selected set score to 1.

194. (3.5.13.1-5) According to 46 CFR, Part 58, for protection purposes, what is required of all refrigeration systems?

- o (a) refrigerant receiver
- o (b) high pressure cut-out
- o (c) low pressure cut-out
- • (d) pressure relief device

If choice d is selected set score to 1.

195. (3.5.13.2-1) What would be an example of a small appliance as defined in the EPA Clean Air Act rules?

- o (a) a 25 ton air conditioning system set up as a split plant with the condensing unit on deck
- o (b) a 200 ton low pressure centrifugal chiller for cargo hold air conditioning
- • (c) a hermetically sealed water cooler with a 2 lb. refrigerant charge
- o (d) a self-contained walk-in freezer with a 60 lbs. refrigerant charge

If choice c is selected set score to 1.

196. (3.5.13.2-2) Which best defines a "Type I" small refrigeration appliance according to the EPA Regulations Section 608?

- o (a) refrigerators, freezers, room air conditioners and central air conditioners
- • (b) systems manufactured and hermetically sealed having a capacity of five pounds (2.27 kg) or less of refrigerant
- o (c) any appliance charged with less than two pounds (0.91 kg) of refrigerant
- o (d) any appliance charged with less than ten pounds (4.54 kg) of refrigerant

If choice b is selected set score to 1.

197. (3.5.13.2-3) If you find the pressure of a refrigeration system containing a Class I or Class II refrigerant to be opened for the accomplishment of repairs is 0 psig, what must be done?

- o (a) only recover the vapor refrigerant
- o (b) only recover the liquid refrigerant in the system
- o (c) recover liquid and vapor refrigerant and have it reclaimed
- • (d) do not attempt to recover the refrigerant and repair the leak before pulling a vacuum on the system

If choice d is selected set score to 1.

198. (3.5.13.2-4) EPA Clean Air Act rules permit refrigerant to be released to the atmosphere under which of the following conditions?

- o (a) when testing a system for leaks using R-12 and nitrogen
- • (b) when release is considered 'de minimis'
- o (c) when adding oil to a compressor
- o (d) during replacement of a compressor

If choice b is selected set score to 1.

199. (3.5.13.2-5) All shipboard personnel responsible for the maintenance and repair of air conditioning systems using refrigerants covered under the EPA Clean Air Act venting prohibition, must be certified through an approved Environmental Protection Agency (EPA) program to do which of the following?

- (a) before performing any maintenance or repair regardless of the actual procedure
- (b) before they can set the operating controls of the system
- (c) before performing maintenance, service or repair that could reasonably be expected to release Class 1 or Class 2 refrigerants into the atmosphere
- (d) before they can pump down the system in preparation for shifting over to the standby condensing unit

If choice c is selected set score to 1.

200. (3.5.13.2-6) When recovering R-12 from a small appliance with a working compressor, using a recovery device manufactured after November 15, 1993, what percentage of the remaining charge must be removed from the system?

- (a) 99%
- (b) 80%
- (c) 75%
- (d) 90%

If choice d is selected set score to 1.

201. (3.5.13.2-7) Persons recovering refrigerant from small appliances must be certified as what type of technician under the EPA Clean Air Act rules?

- (a) Type II technician
- (b) Type III technician
- (c) Type I or Universal technician
- (d) All of the above

If choice c is selected set score to 1.

202. (3.5.13.2-8) According to the EPA Clean Air Act rules, what is true concerning refrigerant leaks in a small hermetically sealed shipboard water cooler with a 20 ounce charge weight?

- (a) Legally, the leaks are not required to be repaired, but morally it is advisable to repair the leaks.
- (b) The leaks must be repaired if the annual leak rate exceeds 15% of the total charge
- (c) The leaks must be repaired within 30 days.
- (d) The leaks must be repaired if the annual leak rate exceeds 35% of the total charge.

If choice a is selected set score to 1.

203. (3.5.13.2-9) Within the territorial limits of the United States, violations of the Clean Air Act of 1990, that includes the intentional release of R-11, R-12, R-22 and other related class I or class II substances may result in fines for each violation per day of what amount?

- (a) $25,000
- (b) $10,000
- (c) $50,000
- (d) $5,000

If choice a is selected set score to 1.

204. (3.2.17.1-1) What type of HVAC system is ideally designed to serve a large public space?

- (a) A dual duct system
- (b) A terminal reheat system
- (c) A variable air volume system
- (d) A single zone system

If choice d is selected set score to 1.

205. (3.2.17.1-2) What type of HVAC system is characterized by poor air distribution and ventilation and low system heat loads?

- (a) A terminal reheat system
- (b) A single zone system
- (c) A variable air volume system
- (d) A dual duct system

If choice c is selected set score to 1.

206. (3.2.17.1-3) Referring to illustrated diagram, what type of HVAC system is shown? (GS-RA-09)

- (a) A dual duct system
- (b) A terminal reheat system
- (c) A variable air volume system
- (d) A single zone system

If choice d is selected set score to 1.

207. (3.2.14.1-4) Referring to illustrated diagram, what type of HVAC system is shown? (GS-RA-42)

- (a) A dual duct system
- (b) A terminal reheat system
- (c) A variable air volume system
- (d) A single zone system

If choice b is selected set score to 1.

208. (3.2.17.1-5) Referring to illustrated diagram, what type of HVAC system is shown? (GS-RA-43)

- ○ (a) A single zone system
- ○ (b) A variable air volume system
- • (c) A dual duct system
- ○ (d) A terminal reheat system

If choice c is selected set score to 1.

209. (3.2.17.1-6) What type of HVAC system is characterized by a having a split supply air stream, with one for cold air and the other for hot air?

- ○ (a) A variable air volume system
- • (b) A dual duct system
- ○ (c) A terminal reheat system
- ○ (d) A single zone system

If choice b is selected set score to 1.

210. (3.2.17.1-7) What type of HVAC system is characterized by having control dampers in locations other than the outside air supply, outside air exhaust, and recirculation damper applications?

- ○ (a) A terminal reheat system
- ○ (b) A dual duct system
- ○ (c) A single zone system
- • (d) A variable air volume system

If choice d is selected set score to 1.

211. (3.2.17.2-1) In the illustrated single zone HVAC system, what prevents the simultaneous flow of steam through the preheat coil and flow of chilled water through the cooling coil? See Illustration GS-RA-09

- • (a) The supply air duct thermostat controlling the steam flow is set several degrees lower than the design off-coil temperature associated with the cooling coil.
- ○ (b) The supply air duct thermostat controlling the steam flow is set equal to the design off-coil temperature associated with the cooling coil.
- ○ (c) Simultaneous steam flow through the preheater and chilled water flow through the cooling coil is permitted for the purposes of space humidity control.
- ○ (d) The supply air duct thermostat controlling the steam flow is set several degrees higher than the design off-coil temperature associated with the cooling coil.

If choice a is selected set score to 1.

212. (3.2.17.2-2) In the illustrated single zone HVAC system, what statement represents the relationship between the exhaust, outside air and recirculation dampers? Refer to Illustration GS-RS-09

- (a) The more the exhaust and recirculation dampers are open, the more the outside air damper is closed, and vice versa.
- (b) The more the outside air and recirculation dampers are open, the more the exhaust damper is closed, and vice versa.
- (c) The more the exhaust and outside air dampers are open, the more the recirculation damper is closed, and vice versa.
- (d) The the exhaust, outside air, and recirculation dampers are all open or closed to the same degree for all operating conditions.

If choice c is selected set score to 1.

213. (3.2.17.2-3) In the illustrated terminal reheat multiple zone system, what statement represents the functioning of the summer outside air duct thermostat? (GS-RA-42)

- (a) During the cooling season, the summer thermostat senses the outside air temperature and opens the exhaust and outside air dampers when the outside air temperature is significantly higher than typical indoor air temperatures.
- (b) During the cooling season, the summer thermostat senses the inside air temperature and opens the exhaust and outside air dampers when the inside air temperature is significantly higher than typical indoor air temperatures.
- (c) During the cooling season, the summer thermostat senses the outside air temperature and closes the exhaust and outside air dampers when the outside air temperature is significantly higher than typical indoor air temperatures.
- (d) During the cooling season, the summer thermostat senses the inside air temperature and closes the exhaust and outside air dampers when the inside air temperature is significantly higher than typical indoor air temperatures.

If choice c is selected set score to 1.

214. (3.2.17.2-5) Referring to the illustrated dual duct multiple zone HVAC system, how is the space temperature directly controlled? (GS-RA-43)

- (a) The space air temperature is controlled by automatically proportioning the cold and hot air streams at the mixing unit.
- (b) The space air temperature is controlled by automatically controlling the steam flow through the preheat coil.
- (c) The space air temperature is controlled by automatically controlling the chilled water flow through the cooling coil.
- (d) The space air temperature is controlled by automatically controlling the steam flow through the reheat coil.

If choice a is selected set score to 1.

215. (3.2.17.3-1) Expansion tanks when used in a ship's low temperature hot water heating system may be of the open or closed type. Referring to the illustrated central-station hookup for a hot-water heating system drawing, what would be the normal temperature range of the water? See Illustration GS-0151

- (a) 180°F to 200°F
- (b) 220°F to 240°F
- (c) 260°F to 280°F
- (d) 320°F to 360°F

If choice a is selected set score to 1.

216. (3.2.17.3-2) What type of pump is invariably used as a circulator in a hydronic heating system?

- (a) Reciprocating pump
- (b) Centrifugal pump
- (c) Rotary pump
- (d) Diaphragm pump

If choice b is selected set score to 1.

217. (3.2.17.3-3) What statement is true concerning a one-pipe hydronic heating system?

- (a) Each heating coil inlet temperature is identical, as the hot water inlet temperature to each heating coil progressively rises as the water passes through each successive series-connected coil.
- (b) Each heating coil inlet temperature is identical, as the hot water inlet temperature to each heating coil progressively drops as the water passes through each successive series-connected coil.
- (c) Each heating coil inlet temperature is different, as the hot water inlet temperature to each heating coil progressively drops as the water passes through each successive series-connected coil.
- (d) Each heating coil inlet temperature is different, as the hot water inlet temperature to each heating coil progressively rises as the water passes through each successive series-connected coil.

If choice c is selected set score to 1.

218. (3.2.17.3-4) It is absolutely essential that hydronic heating system hot water piping be kept free of air. Assuming that a system is initially properly filled with water, what is the primary source of air contamination?

- (a) The introduction of air via the makeup water.
- (b) The introduction of air via the expansion tank vent.
- (c) The introduction of air with the convector steam supply.
- (d) The introduction of air via the atmospheric drains tank vent.

If choice a is selected set score to 1.

219. (3.2.17.3-5) What advantage does a 4-pipe hydronic heating/cooling heating system have over a 2-pipe hydronic heating/cooling system?

- (a) A 4-pipe hydronic heating/cooling system requires double the amount of piping as compared to a 2-pipe hydronic heating/cooling system serving the same number of zones.
- (b) A 4-pipe hydronic heating/cooling system allows simultaneous heating and cooling of different zones, whereas a 2-pipe hydronic heating/cooling system does not.
- (c) A 4-pipe hydronic heating/cooling system can serve twice as many zones as a 2-pipe hydronic heating/cooling system.
- (d) A 4-pipe hydronic heating/cooling system requires one-half the amount of piping as compared to a 2-pipe hydronic heating/cooling system serving the same number of zones.

If choice b is selected set score to 1.

220. (3.2.17.4-1) Concerning cargo-hold dehumidification, what statement is true?

- (a) Cargo hold moisture content is increased by supplying relatively humid air from the outside and exhausting relatively dry air to the outside.
- (b) Cargo hold moisture content is reduced by supplying relatively humid air from the outside and exhausting relatively dry air to the outside.
- (c) Cargo hold moisture content is increased by supplying relatively dry air from the outside and exhausting relatively humid air to the outside.
- (d) Cargo hold moisture content is reduced by supplying relatively dry air from the outside and exhausting relatively humid air to the outside.

If choice d is selected set score to 1.

221. (3.2.17.4-2) What statement is true concerning a liquid desiccant cargo-hold dehumidification system?

- (a) Water vapor from the humid air inlet from the cargo hold is condensed and absorbed into the liquid desiccant by means of a heating coil located in the humidification chamber.
- (b) Water from the humid air inlet from the cargo hold is evaporated and driven out of the liquid desiccant by means of a cooling coil located in the humidification chamber.
- (c) Water vapor from the humid air inlet from the cargo hold is condensed and absorbed into the liquid desiccant by means of a cooling coil located in the humidification chamber.
- (d) Water from the humid air inlet from the cargo hold is evaporated and driven out of the liquid desiccant by means of a heating coil located in the humidification chamber.

If choice c is selected set score to 1.

222. (3.2.17.4-3) What statement is true concerning a liquid desiccant cargo-hold dehumidification system?

- (a) Water absorbed in the liquid desiccant is evaporated and driven out of the desiccant by means of a heating coil located in the regeneration chamber.
- (b) Water absorbed in the liquid desiccant is evaporated and driven out of the desiccant by means of a cooling coil located in the regeneration chamber.
- (c) Water absorbed in the liquid desiccant is condensed and absorbed into the desiccant by means of a cooling coil located in the regeneration chamber.
- (d) Water absorbed in the liquid desiccant is condensed and absorbed in to the desiccant by means of a heating coil located in the regeneration chamber.

If choice a is selected set score to 1.

223. (3.2.17.4-4) With regard to the cooling and heating coils and humidification and regeneration chambers of a liquid cargo-hold dehumidification system, what statement is true?

- (a) The chamber that processes the cargo-hold air contains the cooling coil and is known as the regeneration chamber. The chamber that processes the outside air contains the heating coil and is known as the humidification chamber.
- (b) The chamber that processes the cargo-hold air contains the heating coil and is known as the humidification chamber. The chamber that processes the outside air contains the cooling coil and is known as the regeneration chamber.
- (c) The chamber that processes the cargo-hold air contains the cooling coil and is known as the humidification chamber. The chamber that processes the outside air contains the heating coil and is known as the regeneration chamber.
- (d) The chamber that processes the outside air contains the cooling coil and is known as the humidification chamber. The chamber that processes the cargo-hold air contains the heating coil and is known as the regeneration chamber.

If choice c is selected set score to 1.

224. (3.2.17.4-5) To prevent damage to dry cargoes, the cargo hold ventilation and dehumidification systems play a key role. In terms of the maintained dew point, what statement is true?

- (a) The dew point temperature of the cargo hold is normally maintained at the surface temperature of the cargo or ship structure.
- (b) The dew point temperature of the cargo hold is normally maintained 10^{o}F above the surface temperature of the cargo or ship structure.
- (c) The dew point temperature of the cargo hold is normally maintained 10^{o}F below the surface temperature of the cargo or ship structure.
- (d) The dew point temperature of the cargo hold is normally maintained at a constant temperature regardless of the surface temperature of the cargo or ship structure.

If choice c is selected set score to 1.

225. (3.2.17.4-6) To determine the average cargo hold dew point temperature, at what location would the dew point be measured?

- (a) The dew point is taken at the ventilation exhaust trunk.
- (b) The dew point is taken at the ventilation supply trunk.
- (c) The dew point is taken near a central location of the cargo hold.
- (d) The dew point is taken near the bottom of the cargo hold.

If choice a is selected set score to 1.

226. (3.2.17.4-7) What common feature is found on both liquid-desiccant and solid-desiccant cargo-hold dehumidification systems?

- (a) Both systems require a continuous source of cooling water to drive the moisture out of the desiccant.
- (b) Both systems require a continuous source of heat to drive the moisture out of the desiccant.
- (c) Both systems require a continuous source of heat to absorb moisture into the desiccant.
- (d) Both systems require a continuous source of cooling water to absorb moisture into the desiccant.

If choice b is selected set score to 1.

227. (3.2.17.5-1) What temperature associated with the psychrometric properties of air is measured by an ordinary thermometer?

- (a) The dry-bulb temperature
- (b) The wet-bulb temperature
- (c) The dew-point temperature
- (d) The saturation temperature

If choice a is selected set score to 1.

228. (3.2.17.5-2) Referring to the illustrated psychrometric chart, if the dry bulb temperature is 70^{o}F and the relative humidity is 40%, what is the absolute humidity? (GS-RA-22)

- (a) 38 grains of moisture per pound of dry air
- (b) 45 grains of moisture per pound of dry air
- (c) 51 grains of moisture per pound of dry air
- (d) 58 grains of moisture per pound of dry air

If choice b is selected set score to 1.

229. (3.2.17.5-3) Referring to the illustrated psychrometric chart, suppose air at a dry-bulb temperature of 60°F and a relative humidity of 52% passes over a heating coil, resulting in sensible heat gain, and the off-coil temperature is now 80°F. What is off-coil relative humidity? (GS-RA-22)

- (a) 19%
- (b) 27%
- (c) 55%
- (d) 70%

If choice b is selected set score to 1.

230. (3.2.17.5-4) Referring the illustrated psychrometric chart, suppose during the cooling season that air passes over a cooling coil with a mean surface temperature above the dew point temperature, and this results in sensible heat loss with no change in moisture content. What statement represents the direction of the air conditioning process line? (GS-RA-22)

- (a) The air conditioning process line is horizontal with the coil outlet to the right of the coil inlet.
- (b) The air conditioning process line is horizontal with the coil outlet to the left of the coil inlet.
- (c) The air conditioning process line is vertical with the coil outlet below the coil inlet.
- (d) The air conditioning process line is vertical with the coil outlet above the coil inlet.

If choice b is selected set score to 1.

231. (3.2.17.5-5) Referring to the illustrated psychrometric chart, under what conditions are the dry-bulb, wet-bulb, and dew point temperatures for air all equal in value? (GS-RA-22)

- (a) When the relative humidity is 0%.
- (b) It is impossible for the dry-bulb, wet-bulb, and dew point temperatures to be the same value.
- (c) When the air is completed saturated with moisture and the relative humidity is 100%.
- (d) When the grains of moisture per pound of dry air is zero.

If choice c is selected set score to 1.